LUCID DREAMS: AN ELECTRO-PHYSIOLOGICAL AND PSYCHOLOGICAL STUDY

Ph.D. Thesis

by

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LUCID DREAMS: AN ELECTRO-PHYSIOLOGICAL AND PSYCHOLOGICAL STUDY

THESIS
SUBMITTED IN ACCORDANCE WITH THE REQUIREMENTS OF
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by

KEITH MELVYN TREVOR HEARNE BSc MSc

MAY 1978

mind your head?
Science Museum

Dr Hearne's original chart-record of the first ocular signals from a lucid-dream, and his 'dream-machine' invention are now on permanent display in the Science Museum, London.

*****

Dr Keith Hearne conducted the world's first sleep-lab research into 'lucid' (conscious, controllable) dreams for his PhD at Liverpool University, England.

Hearne:

- obtained the first eye-movement signals from a subject within the lucid dream state, in April 1975
- discovered the 'pre-lucid' REM burst, and 'light switch effect' in dreams
- discovered the basic physiological parameters of lucid dreaming
- invented the world's first 'dream machine'

Background to the first PhD in the world on Lucid Dreaming and the original discovery of the ocular-signaling technique from lucid dreams

After obtaining a BSc in psychology from Reading University, England, in 1973, Keith Hearne went to Hull University in the Autumn of that year, intending to conduct research for a PhD on hypnotic dreams, following discoveries he had made in 'hypno-oneirography'. He decided instead to use newly acquired computer equipment to research electro-physiological aspects of visual imagery*.

During that time he became skilled in running a sleep laboratory. He became interested in 'lucid' dreaming (the paradoxical conscious awareness of dreaming within the dream itself) and reasoned that it must be possible for a lucid dreamer to communicate to the world of wakefulness. A problem, though, was the inherent muscular paralysis of REM sleep.

In 1975 it suddenly occurred to Hearne that since the eye musculature is not inhibited in REM sleep, it might be possible to get subjects to signal by making deliberate ocular movements.

On the morning of 5th April 1975, Hearne wired up a lucid dream subject who was instructed to make a sequence of left-right eye-movements on becoming lucid. A lucid dream was reported at about 8 am, but unfortunately, the monitoring equipment had just been switched off. A week later, on the morning of 12th April 1975, the same subject had another lucid dream. The first signals in the world from a lucid dream were thus recorded.

Hearne continued to obtain more records over the next months. He wound up the work on visual imagery, submitting it for an MSc* and moved to Liverpool University, where he was offered a sleep-laboratory, to research lucid dreams for this PhD, using paid subjects.

During the course of this work he discovered the basic electro-physiological features of lucid dreams, including the pre-lucid REM burst. Hearne also discovered the 'light switch' phenomenon, and invented the first 'dream machine'.

In 1975 Hearne informed psychology departments at American universities of his findings including Stanford (W. Dement) and Chicago (A. Rechtschaffen).

(See on, letter from Rechtschaffen to Hearne)

Hearne, Keith M.T. (1975) Visually evoked responses and visual imagery. MSc thesis. University of Hull, England.

N.B. A book written by Dr Hearne fully described his research into lucid dreams : Hearne, K. (1990) **The dream machine.** Aquarian Press, Wellingborough, England.

(This book may be downloaded at www.keithhearne.com)

Other books :

Hearne, K. (1989) **Visions of the future**. Aquarian Press, Wellingborough, England.

Melbourne, D. & Hearne, K. (1997) **Dream interpretation - the secret.** Blandford Press, London.

Melbourne, D. & Hearne, K. (2002) **The Dream Oracle.** Foulsham, England.

Melbourne, D. & Hearne, K. (1999) **The Meaning of Your Dreams.** Blandford Press

Hearne, K. & Melbourne, D. (2001) **Understanding dreams.** New Holland Press.

(Several other books are pending publication).

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September 5, 1975

See page 143

Mr. Keith M. T. Hearne
Department of Psychology
The University of Hull
Hull HU6 7RX, ENGLAND

Dear Mr. Hearne:

Thanks much for your recent letter on your lucid dream research. I certainly think this research is important because it is the one occasion when the dreamer can critically evaluate his dream consciousness while it is in progress. You have added the ingenious and important element of having the dreamer communicate his observations to you at the same time. There is, of course, good reason to use eye movements for this communication since we know the eye muscles are certainly not inhibited during REM sleep whereas other muscle groups are--at least those in the head and neck region. I have had similar luck with eye movements as a mode of communication during sleep in the study of a narcoleptic lady during sleep paralysis. She could respond to my questions while in sleep paralysis with clear eye movements in the requested direction. As you may know, I think of sleep paralysis as a REM variant in which waking consciousness is not yet completely diminished. (That is why the hypnagogic hallucinations which usually accompany sleep paralysis are viewed as hallucinations rather than dreams, i.e., there is a mixture of reality perception and dreams.) Enclosed is an illustration which shows both the spontaneous and "command" eye movements during an attack of sleep paralysis.

I am convinced by your evidence that lucid dreams do indeed occur during REM periods. I would also guess, intuitively, that they do not occur during NREM sleep. However, the failure to communicate with eye movements does not necessarily mean that lucid dreams do not occur in NREM sleep. There might be a "sluggishness" of eye movement control in NREM sleep which would prevent their communication by that technique.

Do not worry about my spreading your findings around. Keep up the good work.

Sincerely yours,

Allan Rechtschaffen

Allan Rechtschaffen, Ph.D.
Professor, Departments of
Psychiatry and Behavioral Sciences
Director, Sleep Laboratory

/cb
Enclosure

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I should especially like to thank the main subject in this study, Alan Worsley of Hull, for his great co-operation over the 3 years of experimentation. Also, all the other subjects who volunteered to spend nights in the sleep-laboratory with no remuneration.

The Department's workshop staff, under Eric Britton, deserve credit for their friendly efficiency in providing equipment, and I am grateful to Brian Mitchell and Eddy Cookson for designing and constructing the 'CEMOS' device to my specifications.

Keith M.T. Hearne

Dept. of Psychology

University of Liverpool. May 1978.

ABSTRACT

The aim of this research was to make original investigations into 'lucid-dreams' (those in which the dreamer has insight that the experience is a dream). A new method of ocular signaling from these dreams was discovered, so circumventing the bodily paralysis of Stage REM sleep, and establishing a mode of communication from the sleeping subject.

All-night Polygraphic recordings were obtained from 18 subjects who reported having lucid-dreams. However, after extensive monitoring only two of the eighteen subjects were able to produce lucid-dreams in the laboratory. Much physiological and psychological information on these dreams in the best subject was made available using the new technique. All the lucid-dreams occurred in Stage REM sleep and had a mean duration of 4 minutes. There were no differences in the sleep-patterns between Control and lucid-dream nights. The temporal order of events reported on waking corresponded in general to the signaled information. A group of simulating Control subjects were unable to reproduce ocular signals with REM EEG on waking from Stage REM sleep. Additional data was analysed concerning home lucid-dreams. A 4-day cycle accounted for 25% of the subject's lucid-dreams and they tended to occur more after days of above average stimulation.

A large group of persons who reported having lucid-dreams provided questionnaire data. Personality and intelligence factors were also studied in relation to these dreams, but no significant findings resulted.

A method of induction of lucid-dreams was tried unsuccessfully on a group of subjects, but a later technique showed promise. A study of 2-way communication between subject and experimenter was inconclusive.

Three inventions were devised as a result of this research: a switching device operated by ocular signals; a device for waking persons at the early stage of nightmares; a device to induce lucid-dreams and false-awakenings.

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CHAPTER I

AN OVERVIEW

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CHAPTER I

I.1 AIMS OF THIS RESEARCH

The purpose of this programme of research was to investigate a remarkable type of dream (the 'lucid' dream) in which, reportedly, consciousness and volitional control are present i.e. the dreamer has insight whilst dreaming that the experience is a dream and can, to some extent, manipulate dream content and course of action. Very little appeared to be known about lucid-dreams, yet it seemed that, potentially, they held the key to unraveling much about dreams generally, and also could assist the understanding of other psychological processes such as memory and thought.

It seemed not unreasonable to suppose that suitable Subjects could report information from ongoing lucid-dreams in some way. This would provide knowledge on dreams from within the dream for the first time. Obviously, a signaling technique (from the Subject) would first have to be devised, though.

A primary aim of the research programme therefore was to obtain Subjects who report having lucid-dreams and perform all-night polygraphic monitoring on them. Providing a signaling method could be established, basic electrophysiological data was to be ascertained about lucid-dreams, together with psychological information. One objective was to determine whether lucid-dreams are in fact true dreams occurring in Stage REM sleep, or whether they are a phenomenon of imagery experienced on waking. Electrophysiological monitoring of Subjects could answer that question. Since no previous work appeared to have been conducted on lucid-dreams, the actual course of experimentation in that respect would develop as findings became available. In addition to polygraphic monitoring of lucid-dream Subjects, it was planned to attempt the artificial induction of lucid-dreams in Subjects in order to make research more efficient. Also, questionnaire data from lucid-dreamers would be obtained and analysed to seek any connections between various imagery and sleep phenomena, in the hope of finding clues as to any possible causes of lucid-dreams. Another aim would be to develop any devices which might be useful regarding the induction of lucid-dreams or as aids in experimentation.

I.2 THE FORMAT

This thesis consists of four main parts. The first is introductory, consisting of information on: The methodology concerning the electrophysiological study of sleep and dreams; general sleep-research findings; the history of dreams and various dream theories; collated data on the waking accounts of lucid-dreams; philosophical aspects of dreams. These areas are covered in five Chapters.

In the second part, the experiments are described in detail. The programme followed the plan outlined in I.1. One of the lucid-dreamers was particularly co-operative and produced much valuable sleep-lab and questionnaire data. Once a method of signaling was perfected, one precautionary study involved seeing whether simulating Controls could reproduce the same type of signal when woken from Stage REM sleep. Another study which later suggested itself on the basis of earlier findings was that of testing personality and intelligence factors of Subjects in relation to their reported frequency of experiencing lucid-dreams. In all, 10 Chapters catalogue the experimentation performed in this research.

Part 3 (three Chapters) consists of descriptions of three devices which were developed as a direct result of this research. The first would aid lucid-dream research, but is still in the developmental stage. Another device is designed to wake persons from the early stage of nightmares. The third device is intended to induce lucid-dreams and false-awakenings.

Part 4 of this thesis consists of two Chapters in which the experimental results are discussed and various theoretical speculations are proposed, and overall conclusions are listed and suggestions for further research are stated.

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PART 1

INTRODUCTION

CHAPTER II. THE ELECTRO-PHYSIOLOGY OF SLEEP

CHAPTER III. GENERAL SLEEP-RESEARCH FINDINGS

CHAPTER IV. DREAMS

CHAPTER V. LUCID-DREAMS

CHAPTER VI. PHILOSOPHICAL ASPECTS OF LUCID-DREAMS

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CHAPTER II

THE ELECTRO-PHYSIOLOGY OF SLEEP

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CHAPTER II

II.1 BRIEF HISTORICAL BACKGROUND TO ELECTRO-PHYSIOLOGY

Galvani (c 1790) discovered that the current generated by two dissimilar metals applied to the crural nerve in the leg of a frog caused twitching of the attached muscle. This demonstration showed that nerves conduct electrical impulses rather than some 'vital fluid' - a view that had held for centuries and was most elaborately propounded by Descartes (Lindsley & Wicke, 1974; Sheer, 1961). Later, Nobili (1827) first measured electrical activity in frog muscles.

When technical developments in current detection permitted, Caton (1875) at Liverpool University performed the first published experiments in monitoring the very small electrical activity from the exposed brains of rabbits and monkeys. Caton observed a constantly changing background current and changes at the sensory surface of the brain during sensory stimulation.

At the beginning of this century, several investigators began to study muscles and nerves electrically, and in the 1920s electronic amplification became available for electro-physiological work following the development of the vacuum tube.

The neuro-psychiatrist Hans Berger (1929) at the University of Jena published an account of the recording of electrical activity from the scalps of human Subjects (Gloor, 1969). He reported the discovery of rhythmic 10Hz waves (which he termed 'alpha waves') in Subjects with eyes closed. In addition, he observed smaller amplitude faster frequency activity which he called 'beta waves'.

He also termed the whole record the 'Elektrenkephalogram' (EEG). For electrodes, Berger used two large saline pads on the forehead and occiput.

His findings were treated sceptically by other electro-physiologists until Adrian & Matthews (1934) replicated his results. Many varied investigations then began and the rapid advancements in equipment (e.g. multiple channel recording, cathode-ray oscilloscope monitoring) aided this work.

Apart from animal studies, investigations were initiated to seek physiological, psychological and pathological correlates of the EEG in humans. Loomis, Harvey & Hobart (1935, 1936) observed the EEG of sleep and noted vast changes during that state.

Berger's original observation that epilepsy and other neurological disorders produced an abnormal EEG was taken up by others. Dawson (1951) introduced an 'averaging' technique for teasing out minute evoked responses from the background EEG. W.G. Walter, Cooper, Aldridge, McCullum & Winter (1964) first observed a slow negative potential (d.c.) shift associated with anticipation - the Contingent Negative Variation (CNV).

From the point of view of sleep research, a most important discovery was that of the different sleep-stages - including REM (Rapid-Eye-Movement) sleep, which was shown to be associated with Subjective reports of dreaming (Aserinsky & Kleitman, 1953; Aserinsky & Kleitman, 1955; Dement & Kleitman, 1957b).

II.2 ELECTRO-PHYSIOLOGICAL MEASUREMENT

a. Technical points

AMPLIFIERS The minuteness of electro-physiological measures, especially the electro-encephalogram (measured in millionths of a volt), necessitates the use of very sensitive high-gain amplifiers for monitoring and recording purposes. In modern research, multiple-channel high quality instruments (polygraphs), often linked to computers, enable the sophisticated recording and analysis of data. A typical instrument is equipped with variable time-constant, variable chart speed and electronic filtering facilities.

ELECTRODES The interface between skin and recording instrumentation is of crucial importance in obtaining accurate measurement. High-conductivity silver electrodes coated with silver-chloride are commonly employed in electro-physiological work. Their relative non-polarising characteristic permits direct-current potentials to be recorded without a constant signal shift. Electrodes need to be firmly attached with collodion glue (where hair is present) or surgical tape to the skin.

ELECTRODE GEL Electrolytic past or gel - a chloride salt of a formula consistent with the chemistry of the epidermis, is placed between the electrode and skin, to conduct the electrical potentials. A grease solvent such as acetone is used to cleanse the skin so reducing skin-resistance before attachment of electrodes.

ARTEFACTS A number of sources of artefact exist which can obliterate or modify measured potentials. For instance, skin-stretching occurring when the Subject moves, can cause high-voltage transients. Electrical interference ('mains hum') is another potential bug-bear which may be present when electrodes are poorly attached or the Subject not grounded. Bias potential results from two electrodes having an imbalance in ionic transfer, due to different metallic properties or surface contamination.

Polarisation is a back-electromotive force occurring as a result of electrolysis between the electrode and electrolyte - in one direction, so either increasing or decreasing the true potential. (Thompson & Patterson, 1974; Greenfield & Sternbach, 1977).

b. The electro-encephalogram (EEG), electro-oculogram (EOG) and electro-myogram (EMG) The electro-encephalogram is a graph of voltage plotted over time, measured from the most superficial layers of the cerebral cortex (Stevens, 1974). The frequency and amplitude of the monitored brain activity provide the basic data for the encephalographer. Two modes of electrode placement exist i.e. monopolar (referential) or bipolar. In the former case there is an active recording electrode which is 'referred' to an 'indifferent' electrode positioned on a supposedly electrically neutral site such as ear-lobe. In bipolar recording, the signal represents the difference electrically between the two electrodes.

The international 10/20 system of electrode placement (Jasper, 1958) has been widely adopted for EEG recording. This uniform system enables a better comparison of studies from different laboratories. Electrodes are positioned at points on imaginary circles 10 or 20 percent of the distance along the axes from nasion to inion and preauricular points coronally (Figure I.1, page 17). Gibbs & Gibbs (1964) criticised the 10/20 system as being geometric rather than satisfying the requirements for the best electrical placements. Rémond & Torres (1964) modified the 10/20 system for use with infants and small children. In the normal EEG there are four main frequency bands. Changes in the predominance of different bands occur during maturation (Lindsley & Wicke, 1974). These bands are:

1.DELTA W.G. Walter (1937) introduced this term to describe certain 'high voltage' (perhaps a few hundred microvolts) slow waves of a frequency of 0.5 to 3Hz. Delta activity is found in the waking EEG of infants and young children, but is abnormal in adults. Factors which cause an increase in intra-cranial pressure, for instance a brain tumour, are linked with the presence of Delta waves. They are also present in Stage 4 sleep (slow-wave sleep) and unconsciousness (Lindsley & Wicke, 1974).

2.THETA This term was also introduced by W.G. Walter (1953). Theta waves have a frequency range of 4-7Hz. During maturation, theta predominates in all head regions, though mainly from posterior and temporal areas. The frequency is slightly higher in the frontal lobes. Theta activity is abundant in childhood and early adult life but decreases in the 20s and is abnormal beyond the age of 30. The presence of theta from the temporal regions of adults and teenagers is thought to be associated with delayed cerebral maturation and is often found in persons with severe behavioural disorders and psychopathy (Hill, 1952). Theta waves are linked with the hippocampus and limbic system (Green & Arduini, 1954); amplitude is usually under 20 microvolts.

3.ALPHA Alpha activity, of a frequency range 8 - 13Hz, first appears in mid-childhood. It is prominent posteriorly over the visual cortex. Typically, it appears in bursts or 'spindles' of 20-100 microvolts. Lindsley (1938, 1939) found the mean frequency from a large adult population to be 10.2Hz. Its frequency may vary by about half a cycle, however in hypothyroidism for instance, the frequency is much reduced. In fevers, the frequency may be elevated one or two cycles. There is much individual variation in the amount of alpha present in the waking EEG. A few persons show virtually continuous alpha ('P' type of Golla, Hutton & Walter, 1943); a minority have little or none ('B' type of Davis, 1941). Most people fit between these two extremes.

The generator sites are not yet known (Andersen & Andersson, 1968). The activity is stronger over the sensory and associated areas of the posterior cortex but is also present over frontal regions. It has an underlying pacemaker mechanism in the thalamus which is linked to the ascending reticular activating system.

Sensory input of any kind can de-synchronise alpha - this is termed 'alpha-blocking'. Lindsley & Wicke (1974) state that alpha is sensitive to unexpected sensory stimuli, to factors which modify the state of arousal and alertness or vigilance and events which elicit or demand specific attention whether they be external events or internal events such as thoughts, ideas, worries, etc. A laterality effect or asymmetrical effect is observed in about 30% of adults i.e. one hemisphere has a greater amplitude - usually the right or 'dominant' hemisphere (Cobb, 1963). In recent years, the volitional control of alpha using biofeedback methods has become popular (Kamiya, 1962, 1967, 1969; Hart, 1967).

4.BETA This common low-voltage (usually under 20 microvolts) activity of frequency range 14 to 30Hz is prominent from the frontal lobes during adulthood. Their study has been much neglected (Lindsley & Wicke, 1974). Jasper & Penfield (1949) found that in a patient with an exposed part of the motor cortex, beta waves at local regions could be blocked by voluntary effort.

5.GAMMA Jasper & Andrews (1938) divided up the beta activity described by Berger (1929) as 20-50Hz into beta waves of 14-30Hz and gamma waves of 30-50Hz.

6.KAPPA Kennedy, Gottsanker, Armington & Gray (1948) found a frequency similar to alpha (8-12Hz) of about 20 microvolts at the temples, which seemed to be associated with intellectual activity. The bursts of kappa are supposed to increase with reading, memory and arithmetic tasks, and problem-solving. Not all subjects evince the waves, but Chapman (1972) suggests that where present it is a reliable effect.

7.MU Gastaut (1952) described this 9-11Hz rhythmic burst which appears in the EEG of about 7% of subjects (Other names are: 'comb', 'wicket', 'rythme en arceau'): It is rare after the age of 30. It is found in the Rolandic area, usually bilaterally asynchronous. The rhythm is apparently decreased by movement or intention to move the contralateral limb.

8.LAMBDA These are single positive waves of 'sawtooth' appearance (over 250mS) recorded at the occiput in some people (Gastaut, 1951; Evans, 1952). They seem to be linked with visual perception.

9.VERTEX WAVES These are single sharp negative waves (generally under 25 microvolts) over the vertex. They occur randomly - especially in children (Gastaut, 1953); 20% of normal adults show them (Roth, Shaw & Green, 1956).

The electro-oculogram (EOG) is a recording of eye-movements obtained from electrodes placed usually above and under the outer canthus of each eye. The electrode arrangement can be varied according to the type of ocular activity being studied e.g. vertical, horizontal or oblique movements. The electrodes pick up potentials caused by movements of the dipole moment of the electrical charge on the retina and cornea of the eye. The cornea is positive (by 1 millivolt) relative to the retina because of the higher metabolic activity of the latter (Greenfield & Sternback, 1972).

The electromyogram (EMG) is a recording of muscle potentials. Electrodes placed over a muscle indicate the general level of tonus as well as monitoring discrete contractions (Greenfield & Sternbach, 1972).

II.3 HUMAN SLEEP-STAGES AND SCORING CRITERIA

Oswald (1962) defined sleep as a healthy recurrent condition of inertia and unresponsiveness. Its study was somewhat limited until all-night polygraphic monitoring of subjects was performed and the various sleep-stages discovered (Aserinsky & Kleitman, 1953; Dement & Kleitman 1957b). In general terms there are two sleep states: Rapid eye movement sleep (REM) and non-REM (NREM). The terminology of sleep states has varied remarkably over the years so that even totally contradictory terms refer to the same state. Freemon (1972) found 25 different nomenclatures for REM and NREM sleep states in the literature (Table II.1, page 18).

Four NREM stages have been distinguished by their different appearance in the polygraphic record. In human sleep there is a roughly 90 minute cycle during sleep in which the different stages appear sequentially.

Typically, the Subject enters NREM stages 1 through to 4, then reverses back to stage 2, after which stage REM occurs. This pattern is repeated several times throughout the night, but the amount of stage 4 decreases each time and the duration of the REM state increases (Figure II.2, page 19).

Rechtschaffen & Kales (1958) published a manual for scoring sleep stages so as to standardise scoring criteria. The authors suggested, among other things, a minimum chart speed of 10mm/sec for clear identification of EEG frequencies, a minimum time-constant of 0.3 secs and a minimum pen deflection of 7.5 - 10mm for 50 microvolts. EEG monitoring from positions C4/A1 or C3/A2 (according to the 10/20 system) was proposed. In EMG recording, high amplification is suggested (20 microvolts or higher) with a fast time-constant to eliminate slow potentials from other sources which could cause amplifier blocking at high gain. Records are scored by judging which sleep stage is present on each page (epoch) - usually of about 20-30 seconds; this judgement sometimes depends on preceding or following epochs. The total percentage of the different stages can then be computed. The sleep stages are:

STAGE 1: This stage occurs first when falling asleep, or after gross body movements in sleep. The EEG is low-voltage mixed-frequency activity, with many 2-7Hz waves. In its latter part, vertex sharp waves may occur. There are often large slow rolling eye-movements in the EOG. The EMG level is usually lower than that of relaxed wakefulness (Roth, 1961).

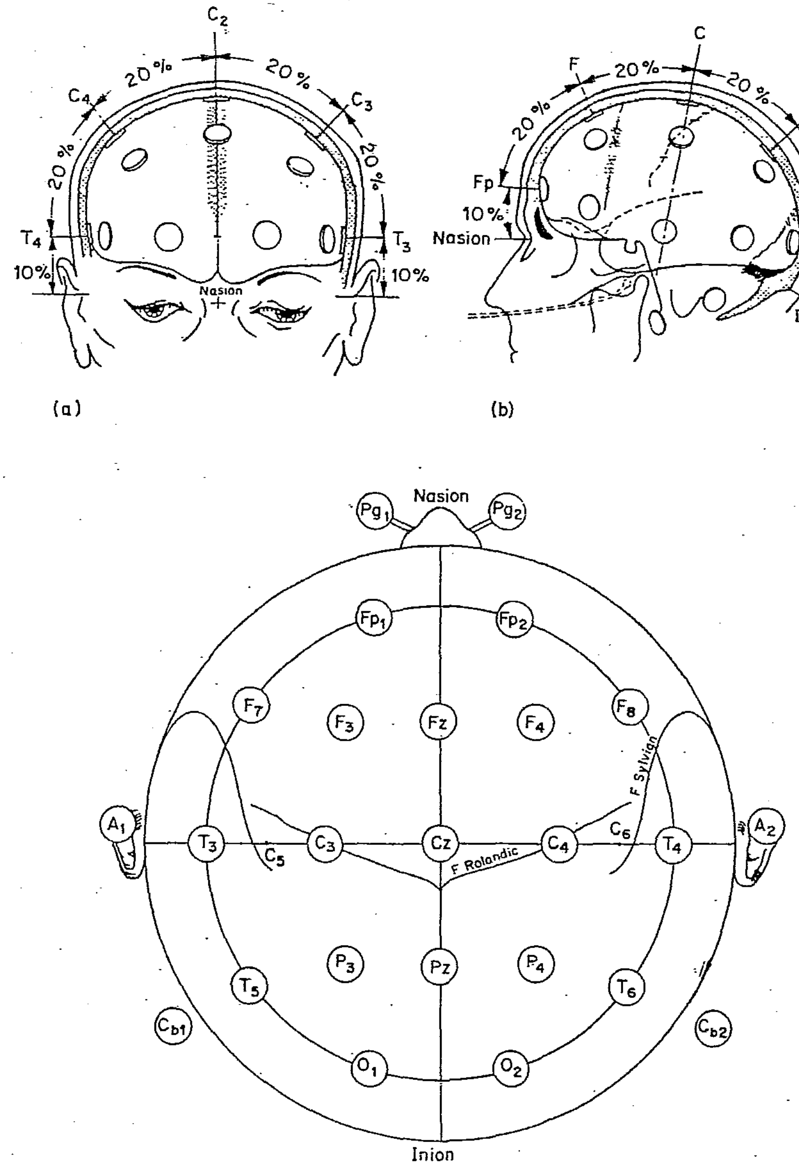
STAGE 2: This stage has 'k-complexes' (Loomis et al, 1938) and/or sleep-spindles present, but the EEG amplitude is still generally low (under 75 microvolts). A k-complex is an EEG wave having a sharp negative front followed by a positive component: for scoring purposes it should exceed 0.5 secs. They occur in response to sudden external stimuli - but may also occur spontaneously (Johnson & Karpam, 1968). Sleep-spindles are bursts of 12-14Hz activity occurring often with a k-complex.

STAGE 3: This stage has been arbitrarily defined as one in which the EEG shows a minimum of 20% and maximum of 50% of 2Hz or slower waves (delta) having an amplitude of at least 75 microvolts peak-to-peak. K-complexes and spindles may be present in stage three.

STAGE 4: Here, the EEG record shows 50% or more of 2Hz or slower waves with a minimum amplitude of 75 microvolts; sleep-spindles may or may not occur.

STAGE REM: (See Figure II.3, page 21. The EEG here is of low-voltage mixed frequency, like that of Stage 1, with - very often - distinctive 'saw-tooth' waves (Schwartz & Fischgold, 1960; Berger, Olley & Oswald, 1962). Alpha is usually a little more prominent than in Stage 1, but the frequency is slower by 1-2Hz than during wakefulness (Johnson, Nute, Austin & Lubin, 1967). No k-complexes or spindles are present in stage REM. A main characteristic is the presence of episodic REMs. Stage REM sleep is not so scored if mental-submental muscle tonus is high in the EMG (Berger 1961; Jacobson, Kales, Lehman & Hoedemaker, 1964). Complicated and specific rules for scoring stage REM under all conceivable conditions are stated in the sleep-manual of Rechtschaffen & Kales (1958).

The basic electro-physiological criteria of sleep having been stated, in the next chapter an overall view of general sleep-research findings will be reviewed to illustrate the nature of sleep and the various experimental approaches.


C2
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Pg1
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F7
F3
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F4
F8
F Sylvian
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T3
C5
C3
Cz
F Rolandic
C4
C6
T4
A2
P3
Pz
P4
T5
T6
Cb1
Cb2
O1
O2
Inion

Frontal view of the skull showing the method of measurement for the central line of electrodes. (b) *Lateral view of skull to show methods of measurement from nasion to inion at the midline. F_p is frontal pole position, F is the frontal line of electrodes, C is the central line of electrodes, P is the parietal line of electrodes and O is the occipital line. Percentages indicated represent proportions of the measured distance from the nasion to the inion. Note that the central line is 50% of this distance. The frontal pole and occipital electrodes are 10% from the nasion and inion respectively. Twice this distance, or 20%, separates the other line of electrodes.* (c) *A single-plane projection of the head, showing all standard positions and the location of the Rolandic and Sylvian fissures. The outer circle was drawn at the level of the nasion and inion. The inner circle represents the temporal line of electrodes. This diagram provides a useful stamp for the indication of electrode placement in routine recording.*

FIGURE II.1

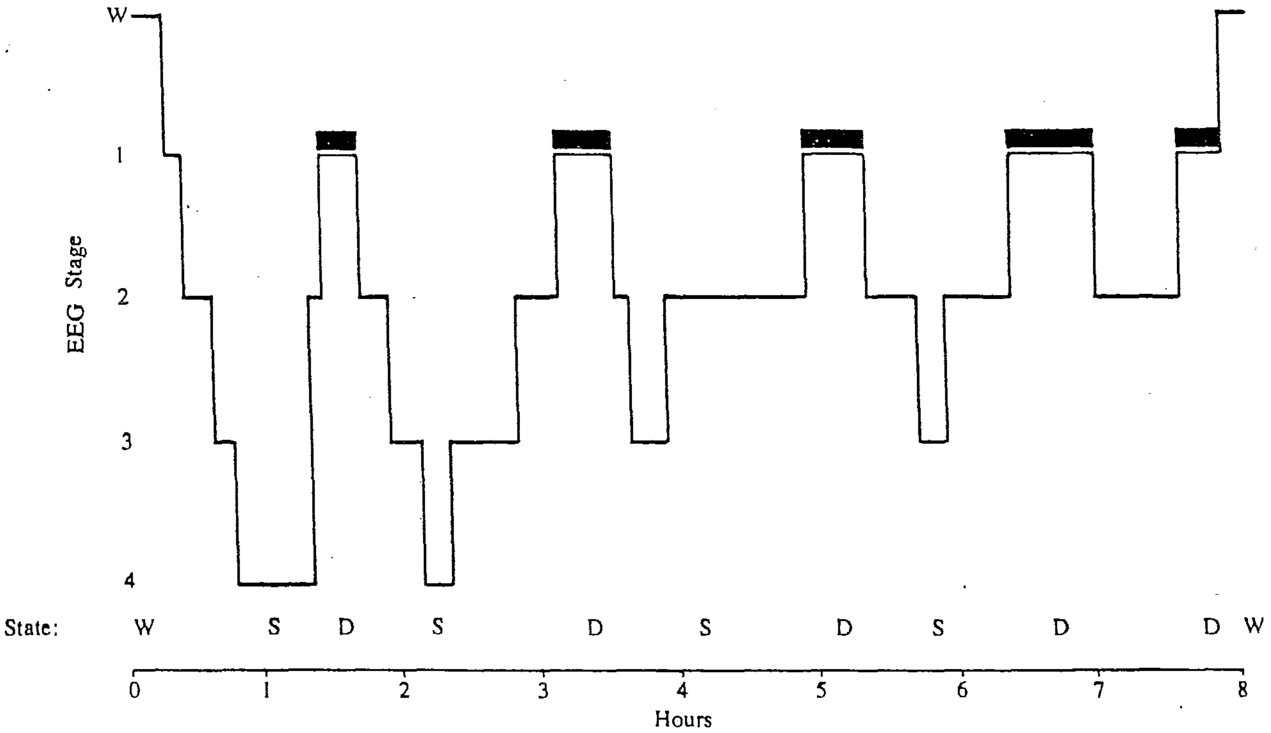
From Jasper, H.H. (1958)
'The ten-twenty electrode system of the
international federation'. Electroenceph.clin.Neurophysiol., 10, 371-375.

TABLE II.1

NOMENCLATURE OF SLEEP STATES

Rem	*Nonrem*	*Typical Reference*
paradoxical	orthodoxical	Jouvet (1960)
paradoxical	slow wave	Jouvet (1967)
para-sleep	ortho-sleep	Iwamura et al. (1967)
rhombencephalic	telencephalic	Jouvet (1961)
rhombencephalic	high voltage	Buendia et al. (1963)
rapid	slow	Allison (1965)
desynchronized	synchronized	Dunlop and Waks (1968)
LVF	HVS	Berger and Meier (1966)
low voltage fast	slow wave	Webb and Friedmann (1971)
D	S	Hartmann (1965)
A, D	B, C	Petre-Quadens (1966)
B	C, D, E	Davis et al. (1938)
S-A	S-1, S-2	Okuma and Akimoto (1966)
1	2, 3, 4	Dement and Kleitman (1957)
1	2	Goldie and Van Velzer (1965)
first sleep	second sleep	Roldan et al. (1963)
2	1	Prechtl (1965)
2	3, 4	Hoffman et al. (1955)
2	3, 4, 5, 6, 7	Toyoda (1964)
activated	ordinary	Dement (1958)
active	quiet	Parmalee et al. (1967)
restless	quiet	Cadilhac et al. (1961)
irregular	regular	Wolff (1959)
light	deep	Karacan et al. (1970)
deep	light	Carli and Zanchetti (1956)

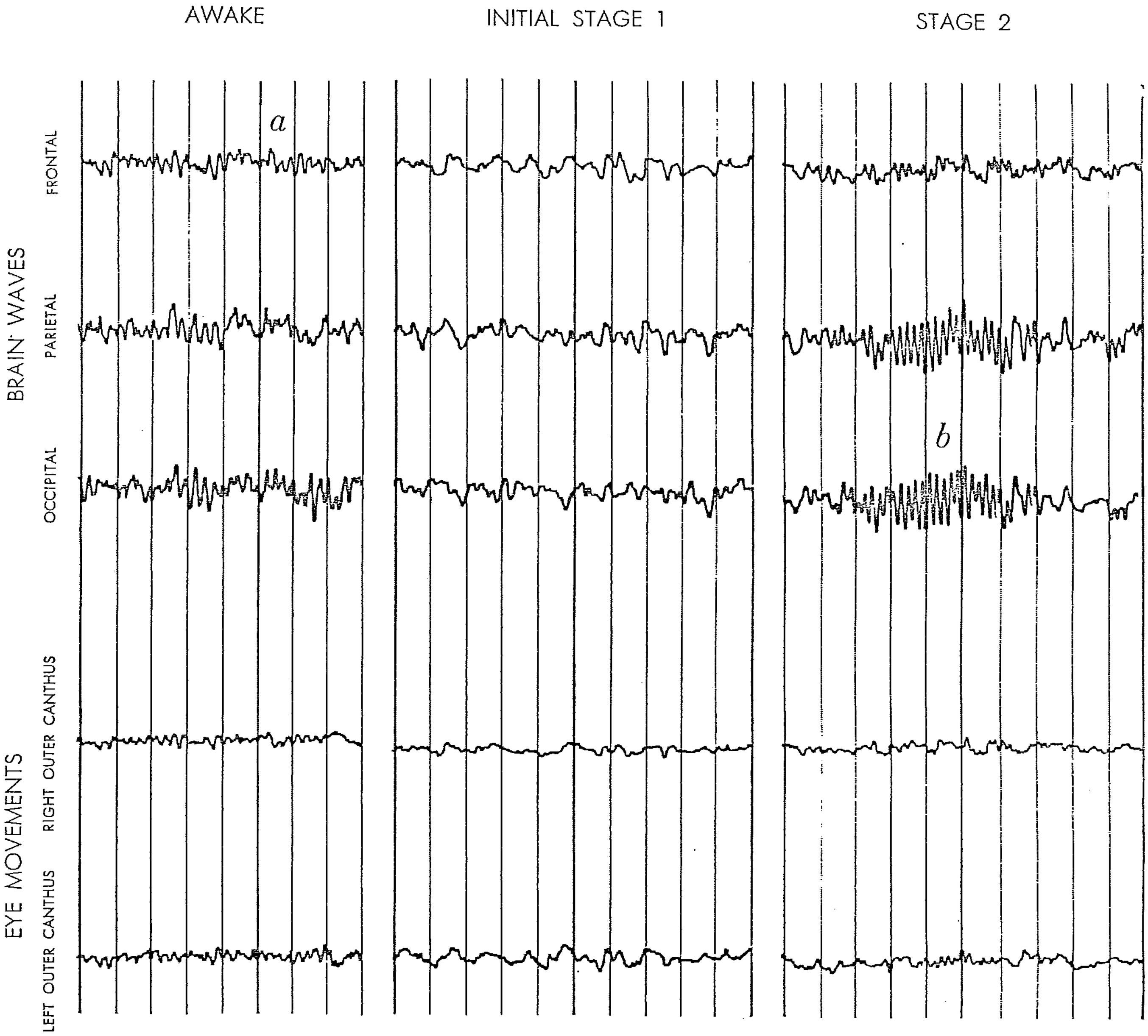
From Freemon (1972) 'Sleep research – a critical review.'



A typical night of sleep in a young adult. The diagram actually represents a mean derived from many all-night recordings. The heavy lines indicate the D-periods, characterized by a stage-1 EEG pattern and the presence of rapid conjugate eye movements. Reprinted from Hartmann (1967). W = waking; S = synchronized sleep; D = desynchronized or dreaming sleep.

FIGURE II.2

(From Hartmann, E., 1967. **The biology of dreaming**. Charles C. Thomas, Springfield, Illinois, USA)

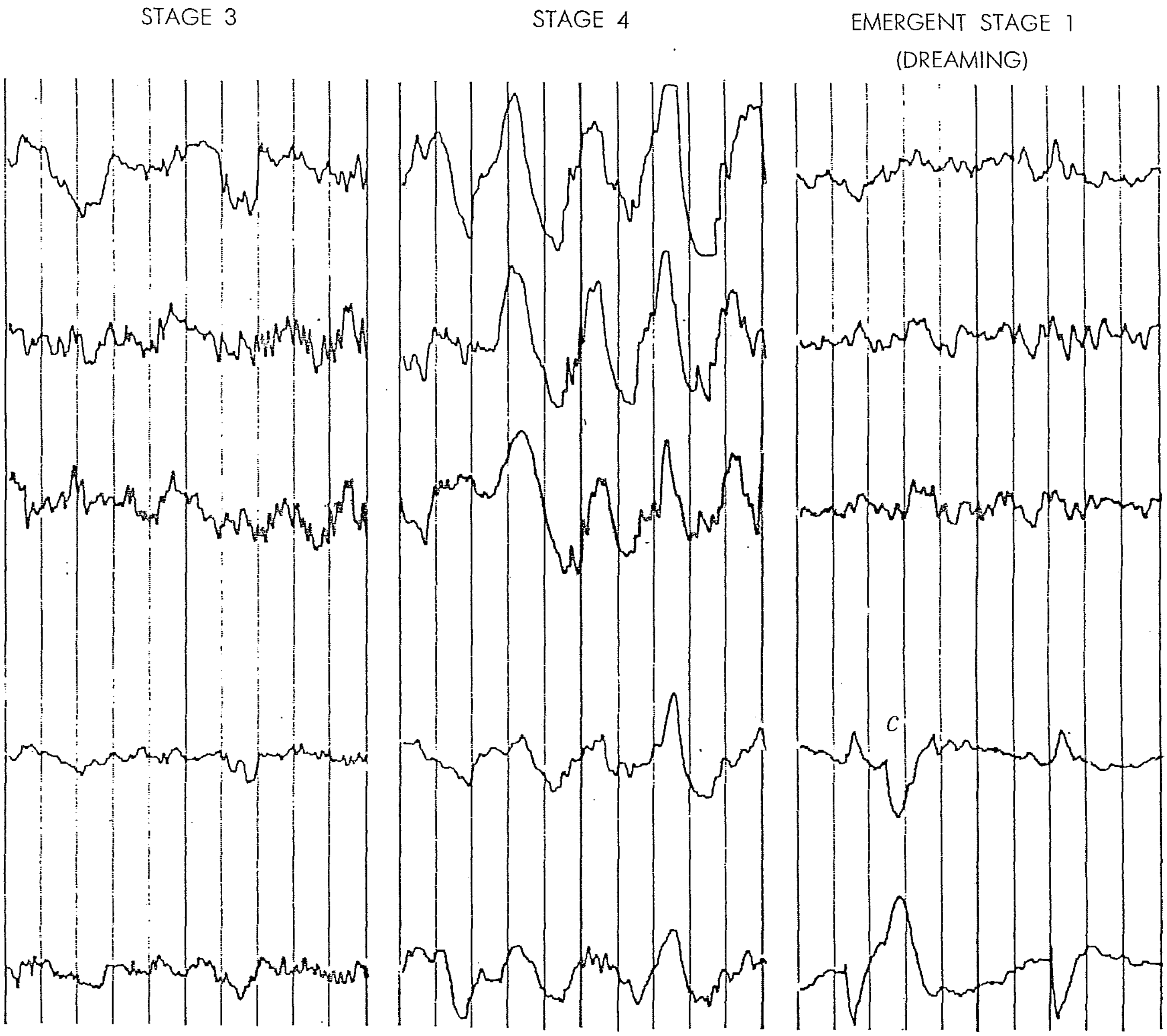


ELECTROENCEPHALOGRAMS show the patterns of brain waves (*top three tracings*) and eye-movement potentials (*bottom two tracings*) that are characteristic of each level of sleep. Labels at left indicate region of head to which recording electrodes are attached. Vertical lines are time-scale; 10 lines represent an interval of four seconds. A subject who is awake but resting with his eyes closed shows the brain-wave pattern known as alpha rhythm (*a*). As sleep begins, pattern known as Initial Stage 1 electroen-

cont..

FIGURE II.3 EEGs OF SLEEP STAGES.

(From: Kleitmann, N., 1960. Patterns of dreaming. **Scientific American offprint** no. 460.)



cephalogram (Initial Stage 1 EEG) appears. During deeper sleep subject shows short bursts of waves called sleep spindles (*b*). Deepest level of sleep (Stage 4 EEG) is characterized by the appearance of large, slow waves. EEG pattern changes from Stage 1 through Stage 4, then swings back to Stage 1. This "emergent" Stage 1 is accompanied by rapid eye-movements, as indicated by peaks in tracings of eye-movement potentials (*c*). Similar peaks during Stage 4 are not eye movements but brain waves that spread to eye electrodes.

FIGURE II.3 (Continued) EEGs OF SLEEP STAGES.

(From: Kleitmann, N., 1960. Patterns of dreaming. **Scientific American offprint** no. 460.)

CHAPTER III

GENERAL SLEEP-RESEARCH FINDINGS

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CHAPTER III

III.1 THE PHYSIOLOGY OF SLEEP

Numerous physiological changes are correlated with sleep, reflecting the alteration in level of metabolism associated with the rest / activity cycle. Body temperature is affected by metabolic rate (measured by oxygen consumption or rate of heat-loss). In sleep, oxygen consumption falls off gradually reaching a nadir after some 6 hours: at that point the curve shows a small inflection (Brebbia & Altshuler, 1965); rectal temperature shows a similar decline curve (Kreider, Busirk & Bass, 1958).

Pulse rate begins to decline before sleep when the body is fairly inactive and falls sharply at first (Schaff, Marbach & Vogt, 1962). Respiratory depression is another characteristic of sleep and the expired air contains increased levels of carbon dioxide (Kleitman, 1963). These metabolic measures are usually quite stable in NREM sleep, but fluctuations are apparent in Stage REM (see page 24).

Basal skin resistance appears to alter too throughout the night; workers have reported that resistance increases i.e. conductivity is decreased (Farmer & Chambers, 1925; Batini, Fressy & Coquery, 1965). Landis (1927) attributed this to drying of electrodes and polarisation. Other experimenters have reported different curves depending on whether a continuous or intermittent current was used (Wenger, 1962; Tart, 1967). This measure therefore remains controversial; studies of blood-pressure in sleep have been inconclusive for the technical reason of accompanying sleep disturbance. Generally though, there is evidence that systolic pressure is positively correlated with depth of sleep (Snyder & Scott, 1972). Plethysmographical studies have shown that vascular dilation of the hands and feet occurs during sleep (Howell, 1897; Johnson & Lubin, 1967).

Body movement is limited during NREM sleep although motility is higher in Stage REM. Overall, the number of movements increases slowly after the first hour or so (Snyder & Scott, 1972). Kleitman, Cooperman & Mullin (1933) reported that a person may make 20-60 postural re-adjustments during the night, but these total a mere 3-5 minutes. Brazier & Beech (1952) found that 6 minutes before a movement, cardiac acceleration occurs. During movement the EEG becomes less synchronised. Auditory thresholds are lowest after a movement and highest some 16-20 minutes later (Mullin, Kleitman & Cooperman, 1937). Motility decreases with 'depth' of sleep although much individual variation is found (Cathala & Guillard, 1961; Rohmer, Schaff, Collard & Kurtz, 1965). Lienert & Othmer (1965) stated that emotionally stable persons have more body movements than unstable subjects.

The physiological and psychological phenomena of REM sleep are so distinct that the Stage is now considered by many to constitute a separate third State, along with NREM sleep and wakefulness (Oswald, 1962; Dement, 1974). Aserinsky and Kleitman (1953) observed that pulse and respiration are generally higher in REM than NREM sleep. Further, much variability occurs in REM (Batini et al. 1965; Snyder, Hobson, Morrison & Goldfrank, 1964). Blood pressure behaves in a similar manner (Khatri & Fries, 1967; Snyder, Hobson & Goldfrank, 1963). Mean increase of these measures in REM sleep from the mean NREM level, was 50% (Snyder & Scott, 1972). Fluctuations also are seen in plethysmographic pulse amplitude and finger skin-temperature (Snyder, 1967), however the Galvanic Skin Response (GSR) and basal skin resistance remain relatively more stable in REM than NREM sleep (Asahina, 1962). The pupil, an index of autonomic activity when awake, remains constricted during sleep and REM (Rechtschaffen & Foulkes, 1965). Brain temperature, which stays fairly constant in NREM sleep, increases significantly in Stage REM sleep (Kawamura & Sawyer, 1965). In males, penile erections are associated with Stage REM (Ohlmeyer, Brilmayer & Huellstrung,1944); Fisher, Gross & Zulch (1965a) found evidence that the phenomenon is not affected by sexual gratification. Karacan, Goodenough, Shapiro & Starker (1966) found, though, that if Stage REM is prevented by wakening, the erection cycle appears in other Stages at the expected times i.e. in the 90 minute cycle. A phenomenon associated with the phasic REM bursts is activity of the stapedius muscle of the middle ear (Baust & Rohrwasser, 1964).

In REM sleep (but not NREM) bodily paralysis is present, as indicated by EMG suppression. Actively induced tonic non-reciprocal motor inhibition occurs which blocks the frenzied activity of the brain during REM (Dement & Mitler,1974). Only small twitches are observed occasionally. Electrically induced reflexes are suppressed in REM indicating active motor inhibition (Hodes & Dement, 1964; Pompeiano, 1965, 1970), Tendon reflexes are abolished and voluntary movement is impossible. Sometimes, a person may wake from Stage REM to find the body paralysed (Sleep-paralysis, page 47). Bremer (1974) remarks that the state of paralysis resembles the 'apparent death' of lower vertebrates and that perhaps nature uses this archaic inhibitory apparatus for protection of the dreamer.

III.2 THE CHANGING CONCEPT OF SLEEP

Early ideas of sleep inclined to a 'passive' theory that sleep occurs to prevent fatigue or is caused by a lack of sensory stimulation (Claparède, 1908; Coriat, 1912). 'Active' theories also appeared i.e. that the brain actively inhibited consciousness. Pavlov (1923) thought that sleep was the result of cortical inhibition spreading from certain areas, and Hess (1931) discovered that cats could be put to sleep by electrical stimulation of the diencephalon. Bremer (1935) invoked the passive notion to explain his finding that the cerveau isolé cat (having a cut through the upper mid brain) remained in virtually continuous sleep. He thought the animal was not receiving enough sensory stimulation to keep awake. In encéphale isolé animals (where the cut is in the lower mid-brain) the sleep-wake cycle persists (Bremer, 1935). Thus, the sleep mechanism seems to be located between these brain areas. Moruzzi & Magoun (1949) discovered that electrical stimulation of the reticular formation roused a sleeping or anaesthetised cat. 'Reverberating loops' were supposed to keep the animal awake in the absence of stimulation (Magoun, 1952).

It became generally accepted that the reticular formation stimulates the cortex to consciousness. Sensory information from the sense organs is routed to the cortex whilst collateral afferents from these nerves link with the reticular formation. Lesions of the pathways to the cortex do not cause sleep, whereas lesions between the reticular formation and the cortex do (Lindsley, Schreine, Knowles & Magoun, 1950). Apparently, impulses from the collateral afferents excite the reticular formation to send diffuse 'activating' impulses to the cortex, so maintaining wakefulness.

There seems to be an inherent rhythmic sleep-wake cycle in the upper reticular formation but wakefulness is aided by external sensory stimulation (Oswald, 1962). Animals without sense organs tend to sleep excessively (Hagamen, 1959). Several factors assist in maintaining wakefulness by stimulation of the reticular formation, the 'gating' function of which controls consciousness. For instance, a decrease in blood oxygen content stimulates chemoreceptors in the carotid body which in turn stimulate the reticular formation. An excess of carbon dioxide in the blood also causes mid-brain stimulation (Bonvallet et al, 1955). Hypothalamic thermodetectors can affect the reticular formation too (Hagamen, 1959), and various influences may also diminish mid-brain activity, so promoting sleep. Baroreceptors in the carotid sinus and aortic arch dampen the reticular formation (Bonvallet, 1955). Heating of the hypothalamus encourages sleep unless excessive (Euler & Söderburg, 1957.)

The cerebral cortex itself is capable of influencing the organism's own state of wakefulness (Hugelin & Bonvallet, 1957a,b; 1958). Worries can keep a person awake and Cannon (1942) stated that in primitive cultures (eg Aborigines) sudden death can occur in persons on the receiving end of meaningful symbolic acts (eg pointing a bone). Obviously, networks of feedback loops operate between the activating reticular formation and the cerebral cortex.

Not everyone subscribes to the concept though; Freemon (1972) states that stimulation of the brain stem near the reticular formation can lead to slow waves; this is the opposite of the Moruzzi and Magoun finding.

Freemon also says that the reticular formation does not project diffusely to the neocortex, but to the limbic areas and orbito frontal cortex, returning then to the reticular formation (Scheibel & Scheibel,1967). Hippocampal arousal (shown by de-synchronisation of the EEG) occurs several seconds before neocortical arousal on external stimulation in NREM sleep (Freemon & Walter, 1970). Some argument exists therefore over the notion of the reticular formation's direct involvement in causing sleep.

III.3 DEVELOPMENTAL ASPECTS OF SLEEP

Differences have been discussed between sleep EEG waveforms for different ages (II.2 (b)). Studies of premature babies show that a virtually constant EEG pattern exists before full-term (Parmalee & Wenner, 1967).

Slow waves do not become evident in the sleeping EEG, along with spindles and K-complexes, until 3 months of age, although Stage REM is present at birth and may constitute 50% of the 16 hours or so daily sleep for the first few weeks (Gibbs & Gibbs, 1950b).

The total amount of sleep and the relative amount of REM decrease steadily until approximately 4 years of age after which it varies within some 2-3% over the years, averaging about 22% (Roffwarg, Dement & Fisher, 1966). Kales, Kales, Jackson, Po & Green (1967) found 30% Stage 4 and 29% Stage 3 in children compared to 11% and 10% respectively for young adults.

Significant changes in the distribution of sleep also occur in the early years of life. The new-born baby has 5 or 6 periods of wakefulness which reduces to 3 or 4 by 6 months (elimination of night feeding is probably responsible Kleitman 1939). At 1 year most infants have a solid 12-14 hour sleeping period with some day sleep (Gessel & Ametruda, 1945.) Thus, early polyphasic sleep is altered by socialisation and maturational factors to a monophasic form. No sex differences appear to exist between the various sleep Stages in young adults (Williams, Agnew & Webb, 1964, 1966).

The main change in EEG of the aged is gradual loss of Delta activity (Agnew, Webb & Williams, 1967; Kales, Jacobson, Kales, Kun & Weissbuch, 1967) although this could reflect a reduced need for deep sleep.

The percentage of Stage REM in the sleep of aged persons has varied in different studies. Feinberg, Koresko & Heller (1967) found over 20% Stage REM, whereas Lairy, Cor-Mordret, Faure & Ridjanovic (1962) give a figure of 14%. However, old persons often take 'cat-naps' during the day which may affect the natural sleep pattern - thus a polyphasic distribution of sleep may recur.

III.4 THE PHARMACOLOGY OF SLEEP

The two states of sleep (NREM & REM) appear to be governed by different neurochemical systems. Injections of 5-hydroxytryptophane (5-HTP) (a precursor of 5-HTP or serotonin) in cats causes NREM sleep (Jouvet, 1967). Injections of reserpine in cats suppresses both states, but subsequent injections of 5-HTP selectively restores NREM sleep (Matsumoto & Jouvet, 1964). Parachlorphenylalanine (p-PCA) selectively blocks 5-HTP synthesis, and Weitzman, Rapport, Mc Gregor & Jacobs (1968) discovered that when injected into monkeys it decreased the amount of sleep by reducing NREM sleep: REM sleep was unaffected. Significantly, anaesthetics increase the amount of serotonin in the brain (Freemon, 1972). Thus, 5-HT appears to be important regarding the presence of the NREM state.

It is possible that the cholinergic system however is important for the production of REM sleep. For instance, the REM state is enhanced in cats by carbachol (a cholinomimetic) and reduced by atropine (a cholinergic blocking agent). In addition, injections of acetylcholine near the locus coeruleus trigger REM sleep in cats (George, Haslett & Jenden, 1964). Jouvet (1969) though, implicated the nor-adrenaline system in the control of REM sleep. Thus, after depletion of nor-adrenaline by reserpine, Dopa (a nor-adrenaline precursor) restored REM sleep (Matsumoto & Jouvet, 1964). The paradoxical finding that persons are hard to rouse from REM sleep (despite the high cortical arousal) could be supported by assuming the nor-adrenaline system is involved in behavioural arousal and that the ascending nor-adrenaline pathways are inactive during REM sleep. Jouvet (1967) thought a link existed between the nor-adrenaline system of the pontine part of the brain stem (ventral and caudal to the locus coeruleus) and ponto-geniculo-occipital spikes occurring in the EEG of cats. Jouvet considered that dreams may be initiated by PGO spikes produced by the release of mono-amines at this site. Perhaps both neurotransmitter substances are operating in Stage REM.

Hypnotics affect the cerebral cortex, the reticular formation or the medulla. Anxiety, causing insomnia may be treated by tranquilisers such as chlordiazepoxide (Librium). Depression, which often results early morning wakening is often alleviated by antidepressants e.g. amitriptyline (Laroxyl), or trimipramine (Surmontil). This latter drug does not decrease REM or result in a rebound effect (Oswald, 1974). Pain which prevents sleep can be treated with morphine or pethidine. The barbiturates are the most effective soporific drugs in use. Unfortunately they are lethal in overdose and can interact with other drugs: they are also addictive (page 44). It is not known exactly how barbiturates work except that they produce widespread inhibition in the cortex. They are either 'long-acting' (e.g. phenylbarbitone) or 'short-acting' (e.g. quinal-barbitone). Newer drugs have appeared, such as the benzodiazepines (e.g. Mogadon) or flurazepam (e.g. Dalmane). These drugs suppress the reticular formation and overdose is not fatal since the medulla (controlling breathing) is not affected. The famous 'Micky-Finn' consisted of alcohol and chloral. A modern version is dichloralphenazone (Welldorm). Sleeping tablets frequently lead to many problems. Dement & Villablanca (1974) stated that "with one or two exceptions, all sleeping pills will always cause or worsen insomnia".

III.5 SLEEP DEPRIVATION

Some persons claim to require little or no sleep (Jones & Oswald, 1968; Meddis, Pearson & Langford, 1973), however, for most people total sleep deprivation leads after several days to visual illusions and hallucinations, speech slurring, inability to concentrate and memory lapses (Ross, 1925; Kollar, Namerow, Pasnau & Naitoh, 1968; Cappon & Banks, 1960; Bliss, Clark & West, 1959; Morris, Williams & Lubin, 1960). Paranoid symptoms may also occur in some subjects (Tyler, 1947, 1955). Boring test situations produce, not surprisingly, the lowest performance scores in sleep deprived subjects. Thus, such persons, when told to signal when they observed a light spot at any one of 8 points on a screen, over 40 minutes, performed steadily worse though watching the screen (Wilkinson, 1960). During auditory tasks errors of omission occurred with the loss of alpha rhythm (Williams, Lubin & Goodnow, 1959). Oswald (1962) attributed such phenomena to falls in cerebral vigilance. Mental capacities can be improved temporarily to waking levels on some tasks if subjects can take their time and amend mistakes.

The EEG of sleep deprivation shows a decrease in the alpha rhythm of relaxed wakefulness (Tyler, Goodman & Rothman, 1947). Additionally, biochemical changes occur, probably due to lack of restoration which mostly occurs in sleep. Plasma iron level and plasma cholesterol both decline (Kuhn, Brodan, Brodancva, & Friedman, l967). Amphetamines temporarily improve the performance of sleep deprived subjects on rote tasks (Weiss & Laties, 1962).

On the first recovery night after sleep deprivation a marked increase in NREM sleep is observed (Berger & Oswald, 1962; Williams, Hammack, Daly, Dement & Lubin, 1964), whilst the REM percentage remains the same (Kales, Tan, Kollar, Naitoh, Preston & Malmstrom, 1970). On subsequent nights REM sleep is higher. Thus, NREM sleep has priority in the recovery process. Studies have been conducted on the selective suppression of REM sleep by means of waking the Subject at its onset, or pharmaceutically by drugs which suppress the state. A remarkable finding is that a 'rebound' effect occurs when uninterrupted sleep is once again permitted. In the case of drugs (most suppress REM), a sharp decrease in the percentage of REM is seen at first. Gradually, the percentage rises to normal, due to physiological tolerance. On cessation of the drug, a rebound occurs (and the amount is larger than by selective awakenings) so that it amounts to 150-200% of the loss. A 'need to dream" has been postulated on such evidence. Early studies suggested that REM deprivation led to profound psychological changes such as irritability (Dement, 1960), extreme hunger (Dement & Fisher, 1963), and oral behaviour with oral symbolism (Fisher, Gross & Zulch, 1965c).

However, Kales, Hoedemaker, Jacobson & Lichtenstein(1968) failed to detect any psychological alterations with long term REM deprivation. Also, depressed patients are not adversely affected by REM deprivation (Vogel, Traub, Ben-Horin & Meyers, 1968) neither are schizophrenics (Vogel & Traub, 1968). Indeed, mono-amine-oxidase-inhibitors (MAOI) which apparently totally suppress REM do not cause abnormalities (Wyatt, Fram & Kupfer, 1971).

III.6 MEMORY AND SLEEP

Jenkins & Dallenbach (1924) found evidence that rote-learnt material was recalled better after 8 hours of sleep than wakefulness, presumably because of the lack of interference by subsequently learnt material. Empson & Clarke (1970) discovered that REM sleep seems to be important for the consolidation process. Twenty yoked pairs of Subjects listened to tapes of nonsense phrases before bed. One Subject was later chosen to be REM deprived, by waking. At that time the other Subject was woken too. The Experimental Subjects showed less recall than the Control Subjects woken at random sleep Stages.

The idea of 'sleep-learning' whereby auditory information is supposedly absorbed and consolidated in the absence of wakefulness is popularly believed to be an established effect. However, Simon & Emmons (1956, 1956a) discovered failings in methodology in such work. They used all-night EEG monitoring on 21 Subjects. After establishing their baseline general-knowledge, they presented each of 96 questions and, 5 seconds later, the answer. Subjects had to call out if they heard an answer during sleep. Subjects were tested the next day to see if they could recall the answers. When Subjects were awake (showing alpha blocking) at the original presentations, recall was very good - when drowsy (alpha present) recall was not so good (50%). Recall was minimal otherwise. The authors also tried repeating stimuli - in the form of 10 one-syllable numbers (Emmons & Simon, 1956b). The Experimental Subjects performed no better than Controls. It therefore appears that memory traces (engrams) are not laid down during sleep.

III.7 EXTERNAL STIMULI AND SLEEP

External stimuli can affect a sleeping person. In Stage 2 of NREM sleep a sudden sensory stimulus causes the appearance of a 'K-complex' in the EEG (Davis, Loomis & Harvey, 1939; Roth, Shaw & Green, 1956). The size of the response appears to be related to the meaningfulness of the stimulus (Oswald, Taylor & Treisman (1960) found that Subjects responded more to their name being called than other names or to their name being played backwards.

In REM sleep, external stimuli may be incorporated into dreams reported on waking. Berger (1963) found that spoken names were included - often in a distorted fashion. Thus, 'Naomi' became 'an aim to ski', and 'Jenny' became 'jemmy'. Dement & Wolpert (1958) tried stimulating Subjects with a tone, light and water-spray. They found the incorporation amounted to 9%, 23% and 42% respectively. Koulack (1969) used an electrical stimulator positioned on the median nerve at the wrist and obtained direct incorporation in 40% of cases and indirect in 24% , when the stimulus was applied 3 minutes after the start of the REM and where wakening occurred 3 minutes after stimulation.

III.8 SIGNALING FROM SLEEP

Several studies have claimed to show that animals and humans can make movements or signals (motor acts or speech) from the 2 states of sleep. The movements though are of a simple repetitive kind, or single responses to stimulation, not requiring higher processing. Oswald (1959c, 1960a) had Subjects moving arms and legs rhythmically to music with eyes closed or taped open. The movements continued but less vigorously with the cessation of alpha rhythm, but sometimes movements ceased. Defensive and reflexive movements may occur in sleep, but these are also found in decorticate animals (Kleitman & Camille, 1932).

Vaughan (1963) used macaca monkeys in an experiment to test whether they could respond (by pressing a bar) to imagery in sensory isolation as they had previously been trained to respond to visual slides. During the long isolation periods some of the animals pressed the bar when apparently asleep and displaying REMs. However, no electro-physiological data was recorded, and of course anthropomorphic inferences cannot be made regarding any human ability to do this. Other possible causes of the bar pressing activity could have been stress, contact-lens irritation (they were used to provide an amorphous visual field), or desire for stimulation rather than the observation of imagery and responses to that.

Williams, Morlock & Morlock (1966) performed an experiment where Subjects pressed a micro-switch when asleep as an instrumental response to switch off one of 2 tones or a single tone. The rate of response was lowest in Stage 1 / REM until punishment for failure to respond was introduced. Then, responses from that Stage improved more than from any other Stage. The authors believed that normally external stimuli are blocked by attending to internal events. It is claimed that some responses in REM occurred in the absence of alpha activity.

Antrobus, Antrobus & Singer (1965) performed an experiment in which Subjects were instructed to signal which sleep-state they judged themselves to be in (Dreaming: 'D' (Stage 1) or Non-dreaming, 'Non-D' (Stages 2, 3, 4)) by pressing a micro-switch taped to the hand. It was assumed that the greater visual imagery of dreaming sleep should provide a suitable contrast for a decision The volitional signal was not elicited by any form of external stimulation. Four young adult females, who were paid, took part in the study for between 5 and 8 nights each. Two Subjects signalled 2 presses for D sleep, and 5 for Non-D sleep, whilst the opposite code was used by the other Subjects. The authors anticipated that D signals should occur at the end of a dreaming period since the Subject's attention would be distracted by the dream during that Stage. A total of 76 signals in all were accepted however the authors state: 'These signals were usually associated with an EEG record which could be best described as indicating a transient period of slight sleep disturbance. Usually some Alpha activity was present on the record as well as muscle and / or body movement. The mean number of seconds of muscle and / or movement artefact preceding the signals was 6.9 seconds; following the signals, 4.4 seconds.' (page 396)

No polygraphic examples were displayed in the paper. In fact, Subjects could not distinguish between the states. More D signals were present than Non-D and 32% of the D signals were at the end of Stage 1.

This author feels that the stated presence of disturbances at the time of signaling strongly suggests that the Subjects were briefly roused from their state - perhaps the demand characteristics (discussed here on page 127) caused an anxiety which periodically woke the Subject. Therefore the study does not provide sufficient evidence that the Subject can produce a physical movement from true uninterrupted dreaming sleep.

Max (1935, 1937) observed finger EMG activity in deaf Subjects (who used sign language) during sleep and claimed that this was not found in normal Subjects. However, Stoyva (1965) discovered similar activity both in deaf and normal Subjects. Finger twitching occurs in REM sleep, but this does not constitute elaborate sign-language components in the deaf. Therefore, the idea of using deaf Subjects to communicate ongoing dreams with sign language is not feasible.

Arkin, Hastey & Reiser (1966) purported to show that post-hypnotic-suggestion enabled a Subject to describe ongoing nocturnal dreams. They presented the results from a single paid Subject who was already an habitual sleep-talker. 'Post-hypnotic-suggestion' was supposed to have resulted in increased NREM talking and to have initiated REM talking (which occurred after cessation of REMs with muscle-tonus artefact and low voltage fast frequency EEG i.e. of wakefulness). It seems in reality that the Subject woke at these points (in response to the heavy demand characteristics of the situation) and spoke a few words. The REM-speech was hardly a description of the full ongoing REMP, since on average it lasted 16 seconds. Since many phenomena assumed to be solely attributable to 'hypnosis' have now been demonstrated in non-hypnotized Control Subjects (Barber 1969), it is to be expected that waking instructions, without 'hypnosis', will achieve the same effects.

In summary, it appears possible that despite the massive motor inhibition of REM sleep (page 25), some simple responsive actions are possible, but meaningful communication requires a waking EEG with associated motor functioning.

III.9 BORDERLAND PHENOMENA

There are several phenomena associated with the process of falling asleep or waking:

a. Imagery Large individual differences exist in the imaging ability of persons when awake (Galton, 1883; Mc Kellar, 1957). In its visual form the capacity varies from being able to conjure up and perceive, like a photograph, detailed eidetic pictures (Haber & Haber, 1964; McKellar, 1957) to a complete absence of imagery. Perky (1910) and Segal & Fusella (1969) found experimentally that Subjects were unable to distinguish between spontaneous imagery and surreptitiously shown slides of low illumination. Some persons, usually good imagers, also experience a phenomenon termed 'hypnagogic hallucinations' in drowsiness before sleep (Maury, 1848; Leroy, 1933; Mc Kellar & Simpson, 1954). These are sensory-like experiences, usually visual or auditory, where for instance a person may observe a sequence of very clear pictures of distorted human faces, amorphous shapes or scenes; or hear one's name called or some meaningless sentence spoken. Mc Kellar & Simpson (1954) found 67 / 110 students reported hypnagogic phenomena: 50 auditory, 34 visual, 17 mixed. Polygraphic studies indicate that these events occur during early sleep, when the waking alpha rhythm has ceased (Davis et al, 1938; Dement & Kleitman, 1957a. Oswald (1962) believes hypnagogic phenomena to be micro-dreams occurring between fluctuations of cerebral vigilance, hence the reported 'spectator' attitude rather than the feeling of participation in the dream. The images are usually spontaneous and apparently unrelated, though Silberer (1909) said that they could symbolise thoughts (the 'autosymbolic' phenomenon). Ladd (1892) considered that dreams derived from images based on ideo-retinal light ('entropic light' - 'eigenlicht'). Binet (1894) thought hypnagogic images were similarly formed. Other writers have disagreed with that 'peripheralist' view saying that visions are centrally constituted (Leroy, 1935; Alexander, 1909). Oswald (1962) opines that hypnagogic images are perceptual responses which need not rely on sense organ stimulation. He cites Money (1960) who found that patients with transection of the spinal cord can still experience sexual orgasm, with no changes in the genitalia. 'Hypnopompic' imagery refers to sensory-like experiences on waking. Thus for instance imagery from dreams may linger for seconds or even minutes after waking (Maury, 1848; Myers, 1903).

b. The falling sensation

Mc Keller (1957) found that 144 / 182 students reported the sensation of falling when drowsy. Typically the person may have the sensation of falling from a cliff or high building.

c. The myoclonic jerk

The falling sensation may be linked with a bodily jerk which can be mild or violent (Roger, 1931; Oswald, 1959b). They seem to occur in light sleep. Oswald (1962) states that these phenomena may be thought of as an abrupt increase in cortical facilitation accompanying arousal.

d. Sensory shock

Weir-Mitchell (1890) described four types of sudden sensory shock occurring to some persons during drowsiness: being struck, hearing a sudden noise e.g. a shot, seeing a brief visual phenomenon e.g. a flash of light, experiencing a sudden odour. A bodily jerk may result from the experience. A feeling of tension may precede the episode (Roger, 1931).

Oswald (1962) points out that the phenomena are comparable to responses to direct electrical stimulation of the occipital motor cortex.

III.10 ABNORMALITIES OF SLEEP

a. Insomnia

Idiopathic insomnia is that condition of sleeplessness uninfluenced by soporific drugs. Dement (1972) reported that the subjective severity of this complaint often bears no relation to the actual amount of sleep obtained by the patient in the sleep-lab. In fact, half the patients had adequate sleep though believing themselves to have spent much time awake. This latter condition constitutes pseudo-insomnia. One explanation of insomnia is that anxiety causes cortical excitation of the reticular formation, the activity of which on the cortex then prevents sleep (Oswald, 1962). Early morning wakening is a common feature of psychotic or endogenous depression (Grinker, Miller & Nunn, 1961). Insomnia is also associated with many pathological conditions which involve increased metabolism, including hyperthyroidism and Parkinsonism (Litvin, 1950), and high blood-pressure (Jacobson, 1929). A few persons actually appear to require little or no sleep at all, and remain healthy (Jones & Oswald, 1968).

An unfortunate eventuality of the chronic consumption of most sleeping tablets (e.g. barbiturates) is drug-dependent insomnia. The initial effect of the drug declines over a period due to physiological tolerance; the dose is then increased to compensate. This cycle can escalate and if the patient desists from taking the drug a rebound amount of REM sleep (which the drug initially suppresses) occurs with accompanying nightmare dreams. The experience of such dreams usually causes the patient to continue taking the hypnotic in order to eradicate them (Gastaut, Luaresi, Berti, Ceroni & Coccagn, 1968).

Electro-sleep, involving electrical stimulation of the scalp and hence brain has been claimed to be an efficacious method of inducing sleep. However, Empson (1973) failed to observe any decrease in sleep latency in normal subjects.

b. Nightmares and pavor nocturnus

There seem to be 3 forms of nightmare. Firstly, the 'incubus attack' of Stage 4 sleep, where a sensation of choking or being assailed is often experienced. Secondly, a similar phenomenon but in Stage 2 sleep, where the severity is somewhat reduced. Thirdly, the Stage REM nightmare dream. The vast majority of nightmares are of the latter type (Fisher, Byrne & Edwards, 1968). Tachycardia and hyperpnea occur during the REM nightmare dream, but in the other types there are no physiological precursors except in fact a slight decrease in respiratory rate (Fisher et al, 1968).

Pavor nocturnus (night terror) occurs rarely in young children, usually aged 3-8. The child wakes terrorised, screams and runs wildly (Kleitman, 1939), though there is apparent amnesia in the morning.

A fuller description of the literature on nightmares is given in Chapter XVIII, in relation to an invention of the author of a device intended to wake persons from the early stage of nightmares.

c. Apnea

Gastaut (1965) described a condition where the patient exhibited a complete cessation of breathing at the onset of sleep due to depression of the respiratory centre. When the blood carbon-dioxide level reached danger point the respiratory centre was stimulated and after some choked breathing the cycle was repeated - throughout the whole of sleep. The usual complaint of these patients is of hypersomnia, since obviously sleep is drastically affected. The patients are usually quite unaware of the hundreds of wakenings in the night (Dement, 1972).

d. Somnambulism

Somnambulism is a disorder of Stages 3 or 4 NREM sleep (Jacobson, Feldman & Bender, 1965; Kales, Jacobson, Paulson, Kales & Walter, 1966; Broughton, 1968). The incidence of this condition is not accurately known. There appears to be a genetic factor involved, since Bakin (1970) reports a 47% concordance in monozygotic twins and 7% in dizygotic twins. Dement (1972) recounts the story of one of his patients who woke one Christmas to find a whole roomful of relations - all apparently sleep-walking. Pierce & Lipcon (1956) found sleep-walkers in the armed forces to be rather emotionally unstable - often suffering also from nightmares, enuresis and phobias. The initial onset often coincided with a chronic illness of one parent. However, Dement (1972) urges that the condition should not be treated since with children anxiety results which could be more harmful.

e. Narcolepsy

This is a disorder of sleep of unknown cause characterised by sleep-attacks, cataplexy and hypnagogic imagery. Attacks of partial or complete muscular paralysis occur in response to strong emotion. During these seizures the person remains conscious but may fall to the ground and be unable to move. If the attack is of extensive duration REMs and dreams may occur. Polygraphic sleep-research has revealed that narcoleptics enter Stage REM sleep immediately on falling asleep (Rechtschaffen, Wolpert, Dement, Mitchell & Fisher, 1963). In the daytime seizures, the body suddenly enters Stage REM sleep. These REM attacks tend to occur at regular points in the day (Passouant et al, 1968). Pseudo-narcolepsy is often associated with some underlying brain disease e.g. multiple sclerosis (Hunter, Blackwood & Bull, 1968). Dement (1972) reports that some 100,000 persons in USA could suffer from narcolepsy.

Normal people as well as narcoleptics occasionally experience sleep paralysis, especially at times of long vigil. One name of the condition is 'night nurses' paralysis' (Rudolf, 1946). This author has experienced sleep-paralysis a few times on waking from dreaming and has been unable to move any part of the body except the eyes. The breathing rate though, was voluntarily variable.

f. Enuresis

Enuresis tends to occur in or just after Stage 3 or 4 of NREM sleep (Finley, 1971; Schiff, 1965). Temmes & Towalka (1954) claimed that 70% of enuretics exhibited epileptic patterns in the EEG. At least 2% of the population are enuretic (Pierce, Whitman, Maas & Gay, 1961). In enuretic children Broughton (1968) observed contractions of the detrusor muscle of the bladder (even in 'dry' nights), but not in normal children. Baller & Schlock (1956) found roughly 15% of 4-14 year old children are persistent bed-wetters.

III.11 THEORIES OF SLEEP

Numerous theories exist as to the function of sleep. It is remarkable though that despite the mass of accumulated data, no single theory has become generally accepted. The matter is further complicated because of the existence of the 2 different states of sleep. Theories attempt sometimes to explain one but not the other. There is an idea that sleep is an evolutionary left-over and is not really necessary. Some people do indeed appear to be able to live with little or no sleep (Jones & Oswald, 1968), but these people are exceptions and sleep deprivation is harmful (Morris, Williams & Lubin, 1960; Lubin, 1967; Wilkinson, 1968). Animals deprived of sleep have died after several days (Licklider & Bunch, 1946).

The finding that increased NREM sleep results from energetic exercise supports the concept that renewal of substances occurs then (Hobson, 1968).

Dement (1964) suggested that REM sleep occurs periodically to clear toxins which build up during the day and NREM sleep. A theory that an oxygen debt builds up during the day and is replenished in sleep (Wohlisch, 1956) has not been substantiated by actual measurements (Mangold, Sokoloff, Conner, Kleinerman, Therman & Kety, 1955). Berger (1969) thought that REM sleep serves to restore the neuromusculature necessary for binocular vision. However, conflicting evidence exists (Herman, Tauber, Rosenman & Roffwarg, 1971).

Snyder (1966) stated that sleep exists to conserve energy and keep the organism out of danger from predators. The REM periods of arousal would be useful to detect anything near. In fact though, cortical thresholds are higher in REM sleep (Benoit & Bloch, 1960) and waking does not always occur. Meddis (1975) also proposed that sleep serves to maintain immobility in animals to aid survival: hence the great variations between different species. Freemon (1970) asserts that there are 2 arousal systems for the different sleeping states, one providing vigilance whilst the other undergoes 'renewal'.

Pavlov (1952) thought sleep happened when Inhibition radiated through the cortex from certain areas. Ephron & Carrington (1966) suggested that NREM sleep may be harmful to the cortex and so 're-afferentation' is periodically introduced in REM sleep.

Ontogenetic considerations by Roffwarg, Dement & Fisher (1966) led to the idea that the great amount of REM sleep in the neonate is necessary to stimulate the cortex during early development since external stimuli are lacking in utero. In the adult, REM would be a left-over from this process.

From a psychological standpoint, Freud said little on the function of sleep except that it was probably ‘biological’ (Hartmann, 1973). Fisher et al (1965 a, b) adopting a psychoanalytical approach considered that REM sleep discharges instinctual drives in the adult and physiological drives in the child.

Numerous notions have emerged recently concerning memory processing and sleep, although Jackson (1932) had declared that sweeping-away of redundant memories and consolidation of new ones could occur in sleep. Evans & Newman (1964) pointed to a very superficial analogy between computers and sleep suggesting that in REM sleep irrelevant information is cleared. Breger (1967) put forward the view that in dreaming sleep 'perceptual learning' occurs.

Moruzzi (1966), Gaardner (1966) and Hennevin & Leconte (1971) all suggest allied memory-consolidation ideas.

Hartmann (1973) believes that NREM sleep has a physically restorative function whereas REM sleep has many functions including neuronal repair, the formation of new links in the cortex, and consolidation of learned material. Oswald (1969) thinks protein synthesis and repair are major functions of REM sleep. He points out that the very long drug rebound phenomenon ties in with the life-span of brain proteins (Oswald 1974).

The recent emergence of a tonic-phasic model for sleep and dreaming (Moruzzi, 1963; Jouvet, 1965; Hartmann, 1967; Grosser & Siegal, 1971) however, has produced a slightly different perspective of the two sleep states. Phasic activity occurs in both NREM and REM sleep (e.g. PGO spikes, REMS, k-complexes, myoclonic twitches). The tonic condition represents the background state. This model helps to explain, for instance, early findings of 'variability of heart-rate' in REM sleep (e.g. Snyder, 1966) Gessel, Marchiafava & Pompeiano (1964) showed that the heart-rate increased after the first REM burst and then slowed in tonic REM. Also, it has been found that gross body movements tend to occur between REM bursts, whereas 'fine muscle activity' (Baldridge, Whitman & Kramer, 1965) is associated with REM activity. The gross body movements appear to act as 'chapter markers' to separate dreams (Dement & Kleitman, 1957a). The tonic / phasic concept therefore reveals perhaps that the REM-NREM dichotomy is too simplistic. Horne (1976) pointed out that REM sleep does not appear to be important anyway. Slow wave sleep (SWS) appears before REM each night and has priority after total-sleep deprivation (Kales et al, 1970). In addition, short sleepers show comparatively large amounts of SWS (Jones & Oswald,1968; Meddis et al, 1973). Using stimulations below the waking threshold Agnew et al (1967) found SWS much more difficult to shift the subject out of than REM. They also observed that REM deprivation led to no behavioural changes whereas SWS deprivation resulted in lethargy and depression. Significantly, the amount of SWS seems to be associated with the length of the prior period of wakefulness (Webb & Agnew, 1971; Karacan et al, 1970). Horne (1975) believes restitutional activity concerning the visual system occurs in sleep. Blind persons show a significantly lower level of SWS than sighted persons (Krieger & Glick, 1971). That view is reinforced by the demonstration (Horne & Walmsley, 1976) that a high daytime visual load increases SWS.

In summary, no clear-cut theory of sleep has yet become universally accepted.

Having discussed the main areas of study in sleep research the next Chapter turns to dreams, observing Man's interest in them from an historical perspective and stating the major explanations to account for them.

CHAPTER IV

DREAMS

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CHAPTER IV

IV.1 ANCIENT INTEREST IN DREAMS

Dreams appear to have been considered important in several ancient societies as providing a channel of communication between this world and other parts of it, with some other existence beyond life, or the deities.

Information about ancient Babylonian and Assyrian beliefs has been secured from archaeological discoveries of cuneiform-script clay tablets, such as those from the great library at Nineveh (5000 B.C.). These societies attempted to interpret dreams e.g. flying indicated disaster for the dreamer (de Becker 1968). Mamu was the Babylonian goddess of dreams. Temples existed to her, where magical rites were conducted to counter devils and spirits of the dead which were supposed to cause unpleasant dreams.

Papyrii (such as the Chester Beatty papyrus, 1,550 B.C.) have survived showing that the ancient Egyptians believed dreams ('omina') were messages from the gods. Serapis was the Egyptian god of dreams. Several serapeums, like those at Thebes and Memphis, were constructed where oracles (the 'Learned Men of the Magic Library') interpreted dreams. The technique of dream incubation was practised whereby a person requiring an answer to some personal question would sleep at the temple (or could send a stand-in) probably after magic rituals, and produce dreams which would then be interpreted by the oracle (de Becker, 1968). As well as providing answers, dreams could warn of impending danger or demand penance. A discourse published in the XIII th dynasty (c 1,770 B.C.) lists many activities in dreams, with simple comments as to whether or not they are good or bad omens. A concept of contraries or opposites prevailed in some interpretations. Thus, if a woman dreamed of kissing her husband, trouble was imminent for her (Sauneron, 1959). An inscription on the sphinx at Giza tells of a dream of Thutmose IV (c 1,450 B.C.) in which he was promised the kingdom by the god Hormakhu in return for clearing away sand from the sphinx.

In early Chinese society dreams were attributed to wanderings of the 'hun' or spiritual soul. In the separated state it could communicate with the souls of the dead. In the Chou-Li (c 400 B.C.) astrological factors were incorporated into dream interpretation. In a Taoist work, the Lie-tseu, six different types of dream are listed: tcheng-mong (ordinary dreams), ngo-mong (dreams of terror), seu-mong (dreams of what was thought during the day), wou-mong (dreams of waking), hi-mong (dreams of joy), kin-mong (dreams of fear).

Yin and yang (2 opposite energy forces, negative or positive, male or female) should be in harmony for good health, and dominance of one of these could lead to distressing dreams. Yin dominance for instance might result in dreams of fire. Dreaming of food meant approaching illness, singing and dancing meant weeping . Again, the notion of opposites was present (de Becker, 1968).

External stimuli were recognised as being incorporated into some dreams, so that if one slept on a belt a snake might be dreamed of. It seems that much empirical evidence was behind Chinese belief but this has been lost. The Taoist concept that a knowledge of the cause of a dream destroyed any fear in it is that of the later psycho-analysts. The Chinese sage Chuang-tzu (c 350 B.C.) raised philosophical questions by considering dreams:

> 'While men are dreaming, they do not perceive that it is a dream. Some will even have a dream in a dream and only when they wake they know it was a dream. And so, when the Great Awakening comes upon us, shall we know this life to be a great dream. Fools believe themselves to be awake now.'
>
> 'Once upon a time, I, Chuang-tzu, dreamed I was a butterfly, fluttering hither and thither, to all intents and purposes a butterfly. I was conscious only of following my fancies as a butterfly, and was unaware of my individuality as a butterfly. Suddenly I was awakened and there I lay myself again. Now I do not know whether I was a man dreaming I was a butterfly, or whether I am a butterfly now dreaming I am a man.' (MacKenzie, 1965; pages 57, 58)

A treatise on dreams in the Atharva Veda (a book of wisdom, 1,500-1,000 B.C.) states early Indian beliefs concerning dream interpretation. Aggressive or power dreams were favourable even if the dreamer suffered mutilation in them. However, a passive role or some form of physical loss (e.g. teeth, hair) was a bad omen. The interpretation by opposites appears here too e.g. seeing oneself dead meant longevity (de Becker, 1968).

The treatise states a negative correlation between period of night of the dream and the time until its realisation in real life. The later in the night the dream the sooner it would operate. Also, it was suggested that if a series of dreams occur, only the last should be interpreted - presumably recognising some form of psychological refining process. Dream content was also linked to the temperament of the dreamer (phlegmatic, sanguine or bilious). This represented a significant advance - the intrusion of physiological / personality aspects in affecting dream content.

Dodds (1957) states that an early Greek idea of dreams was that a god or ghost visited the dreamer, entering the room through a keyhole (often the only aperture). Later, (c 500 B.C.) incubation was practised in temples dedicated to Aesculapius - the god of healing. The course of treatment or medicine to be used were supposed to be revealed to the sick person. Oracles were subsequently present at the temples. The Greeks recognised 'true' and 'false' dreams. Homer stated that true dreams came through the gate of horn, false via the gate of ivory (based on a Greek pun). This true / false, good / bad dichotomy of dreams is a recurring theme in many societies.

The Greek philosopher Heraclitus (540-475 B.C.) made the observation that each man retreats into a world of his own during sleep. This was a turning away from the current superstitious ideas. In the 'Treatise on Dreams' (attributed to Hippocrates) symbolism in dreams is referred to. The universe (macrocosm) may represent the body (microcosm). Thus, in a dream where the stars shine brightly, the body is in good health. Or, to dream of rivers pointed to an excess of blood (de Becker, 1968). Any imminent illness was indicated by a prior 'prodromic' dream. Hippocrates did believe that some dreams were 'divine', from the gods.

Aristotle also thought that dreams could be prodromic, but refuted 'divine' dreams on the grounds that lowly animals have dreams. He pointed out that apparent precognition in dreams might result from the dream affecting waking behaviour, so that self-fulfilling prophecies might occur.

Plato, in his 'Republic', stated that 'In all of us, even in good men, there is a lawless wild beast nature which peers out in sleep.' The 'beast' was set loose during sleep because of the absence of reasoning ability then (Mc Curdy, 1946).

Roman beliefs regarding dreams were similar to those of Greece. The Caesars took them very seriously. Calpurnia, wife of Julius Caesar, was supposed to have dreamed of his assassination the previous night, according to Plutarch. Lucretius (c 11 B.C.) made the interesting statement that dreams are composed of sequences of still images observed quickly. A most outstanding contribution to the study of dreams was made by the Roman Artemidorus (c 200 A.D.). His work 'Onierocritica' (The Interpretation of Dreams) drew upon much early information and reflected the state of the art at that time in a very detailed form. He recognised that each person has different associations to dream images and so individual interpretations are necessary. He noted two classes of dream: Somnium, which have references to the future, and Insomnium, which are everyday dreams. The interpreter had to find out certain points initially: natura (whether the events are natural), lex (lawful), consuetudo (customary for the dreamer), tempus (conditions under which it was dreamed), are (occupation), nomen (name). Associations were obtained and puns noted. Examples of symbolism are also given: the mouth may represent a house, the teeth, people in the home. Sowing, planting, tilling, were said to have a sexual meaning. The recurring notion of opposites in dreams was further exemplified. Clearly, much accumulated observation and knowledge from many civilisations over millennia had crystallised into the Roman art of dream interpretation (de Becker, 1968; MacKenzie, 1965).

IV.2 EARLY CHRISTIAN VIEWS

During the Middle-Ages interest in dreams declined as dream-divination was linked with sorcery by official Christianity. Nevertheless, some dream-incubation persisted into this period. A few Christian writers commented on dreams. The perennial problem was how to distinguish between divine and demoniacal types.

Gregory of Nyssa (c 400) in his treatise 'On the Making of Man', accepted divine dreams, but revived the naturalistic approach (from the Greeks) stating that while sensation and intellect were absent in sleep the 'nutritive faculty' prevailed. He thought dreams could illustrate the dreamer's personality. In addition he stated that the driving force of man's passions, expressed in dreams also, is the drive toward sexual reproduction.

St. Augustine (354-430) believed demons could affect dreams. A prayer attributed to him asks God to maintain him in 'chaste desire' in sleep and protect him from dreams which 'owing to animal images' would result in 'pollution' (de Becker, 1968).

St. Thomas Aquinas, in 'Summa Theologica' wrote that dreams have a prophetic character. He also suggested the idea (reminiscent of Jung's synchronicity concept) that the premonitory dream may be merely a sign - 'a single cause of both the dream and the event'.

IV.3 RELIGIO-POLITICO-CULTURAL DREAMS

Dreams have had a marked effect on the development of some religions at crucial stages. In the case of Christianity the early biblical dreams were accepted as divine revelations yet later interest in dreams was suppressed as sorcery. There are about 15 dreams mentioned in the Old Testament, most of which occurred at critical points in history and propagandised the Jewish cause. Examples are the dreams of: Abimelech, regarding the protection of Sarah and the seed of Abraham; Jacob; Joseph regarding the expulsion of the Jews; Daniel; Solomon. There is a remarkable absence of women in Old Testament dreams. De Becker (1968) points out that a common link is a need to compensate for the dreamer's inferiority by evoking the protection of an omnipotent personage which psycho-analysts would recognise as a father figure. Another observation is that dreams were sometimes repeated until action was taken by the dreamer (e.g. Pharaoh's dream of the years of abundance and famine.) The New Testament dreams have a simplicity suggesting authenticity according to de Becker. Dreams for instance caused Joseph to tolerate Mary's pregnancy, and to flee into Egypt. No dreams of Christ have been recorded (Kelsey, 1968). Macanus and Francis of Assisi, both founders of orders, had vocational dreams.

The Koran of the Mohammedans was apparently revealed to Mohammed via dreams, and dream interpretation was regarded by this group as quite acceptable. The 'adhan' call to prayers was begun by Mohammed as the result of a dream of one of his followers.

Buddha's vocation was determined by dreams of Maya (his mother), Cudhodana (his father) and Gopa (his wife). The latter's dream of universal disaster was interpreted (by opposites) by Buddha to reveal future happiness. De Becker comments that the Buddha family dreams are different from biblical dreams in having no 'will to power'. Five of Buddha's dreams are recorded which directed his life.

An interesting aspect of religious dreams is that the major (and minor) characters in the real situation were reported to have experienced 'convergent' dreams - although 'demand characteristics' (Orne, 1962) could be behind this, especially in a society where dream interpretation was common. Thus, Joseph not only dreamed, so did Jacob, Jacob's father, Pharaoh and his officers. (If precognitive dreams do exist, perhaps they could be more readily identified from 'chance' dreams by seeking this alleged 'convergent effect'.)

Numerous dreams are supposed to have shaped history by affecting the behaviour of powerful men, though of course to what extent they are exaggerated, post hoc, is difficult to ascertain. Another type of dream allegedly describes historical events precognitively, without affecting the event. It is said that Caesar decided to cross the Rubicon and attack Rome after experiencing a dream of incest with his mother. The oracles saw this as a symbolic sign of territorial conquest. Hannibal invaded Italy after an encouraging dream. The German Chancellor Bismarck was confirmed in his plans for was with Austria by a dream he communicated to William I. Ghengis Khan, Cromwell and Hitler had dreams which decided their vocation.

Hitler, when an NCO in the First World War apparently dreamed of being buried by a shell-hit. He was at the Somme and all was quiet. Waking, and feeling restless, he walked into open country - which was dangerous. A shell suddenly hit the place where he had been sleeping, killing all his comrades. From then on the future Führer was convinced he had a divine mission in life (de Becker, 1968).

An example of dreams giving rise to a new philosophical concept is that of Descartes. He had three dreams one night the first he interpreted as an exposition of his one-sidedness i.e. suppressed sexual and religious life. The second expressed his uncertainty, whilst the third indicated to him that he should try to join the forces of philosophy and wisdom. On waking after the second dream he thought he saw sparks in the room so he opened and closed his eyes to convince himself he was awake. This author would suggest that perhaps a false-awakening (See page 113) occurred at that point.

IV.4 PRE-FREUDIAN DREAM NOTIONS

The following summarises Freud's (1900) review of the literature which was directed at certain basic aspects of dreams. (It was preceded by a description of ancient beliefs.)

1. Relation of the dream to the waking state

a. The dream as 'another world' e.g. Strumpell (1877) stated that 'he who dreams turns his back on the world of waking consciousness.'

b. The dream as a continuation of waking life e.g. Weygandt (1893) said 'dreams lead us back into everyday life instead of releasing us from it.' (Also: Haffner, 1884; Jessen, 1855; Radestock, 1878; Hildebrandt, 1875).

2. The material of dreams - Memory in dream

a. Hypermnesia in dreams e.g. Delboeuf (1885) reported that the name of a plant that was in a dream was traced back to an occasion of having written it 2 years before. (Also: Maury, 1878; Jessen 1856).

b. Childhood memories in dreams e.g. Maury (1878) saw in a dream a man who gave his name. He discovered he knew him as a small child. (Also: Hildebrandt, 1875; Strumpell, 1877; Volkelt, 1875).

c. Recent memories in dreams e.g. Robert (1886) stated that normal dreams are usually occupied with impressions of the days before.

d. Insignificant material in dreams (e.g. Hildebrandt, 1875; Strumpell, 1877; Ellis, 1899; Binz, 1878).

3. Dream stimuli and dream sources

a. External sensory stimuli e.g. Maury (1878) had an assistant produce external stimulation (e.g. bells, Cologne water) while Maury slept. Some stimuli were incorporated into dreams. (Also: Jessen, 1856; D'Hervey, 1867; Hildebrandt, 1875; Weygandt, 1893).

Strumpell (1877) and Wundt (1880) tried to explain the mismatching of dream images with the external stimulus by proposing that unclear stimuli gave rise to illusions. (Freud would ask why certain associations are chosen).

b. Internal sensory stimuli e.g. Wundt (1880) said internal stimuli play an important part in dreams (e.g. ringing in ears). (Also: Maury, 1878; Ladd, 1892).

c. Internal physical excitation e.g. Strumpell (1877) said that in sleep the mind becomes more aware of the body (as Aristotle had believed). (Also: Radestock, 1878; Spitta, 1892; Maury, 1878; Simon,1888; Schopenhauer, 1851; Vold, 1896; Krause, 1858, 59).

'Typical' dreams were said to be caused by organic stimulation. Thus, Strumpell (1877) opined that flying dreams are due to the sensation of the lungs sinking when the thorax is insensitive.

d. Psychic exciting sources Freud stated that psychic factors in dreams were usually deprecated. However, Scherner (1861) was an exception and Volkert (1875) had doubts. Wundt (1880) took a middle course stating there is co-operation of somatic stimuli and psychic instigations, which were unknown or day residues.

4. Why the dream is forgotten on waking e.g. Strumpell (1877) gave several reasons: Weak pictures were forgotten soon; most dreams occur only once; dreams lack order; in-rushing sensory input on waking swamps memories; most people are disinterested in dreams; there is a change of feeling on waking. On the matter of possible falsification in the dream memory, Strumpell (1877) stated 'consciousness involuntarily inserts much in the recollection of dreams'. (Also: Jessen, 1856; Eggers, 1895; Spitta, 1892).

5. The psychological peculiarities in dreams

a. The state of falling asleep e.g. Schleiermacher (1862) said that when awake we think in ideas, when asleep psychic activity is thinking in pictures. This latter process is involuntary and occurs in a state of distraction. Spitta (1892) termed the transformation of an idea into an hallucination Dramatization. (Also: Burdach, 1830; Delboeuf, 1885, Strumpell, 1877).

b. Incoherence and lack of laws of causality in dreams (e.g. Lemoine, 1885; Maury, 1878; Strumpell, 1877; Spitta, 1892; Radestock, 1878; Jodl, 1896; Stricker, 1879, 1883).

c. Associations in dreams Stimuli were supposed to awaken thoughts which were presented visually and these progressed by the laws of association (e.g. Strumpell, 1877; Wundt 1880; Weygandt, 1893). Maury (1878) gave examples of phonetic links.

(On the matter of supposedly instantaneous dreams (e.g. Maury’s execution dream), Freud was non-committal, stating it was a delicate and far reaching question.)

Chabaneix (1897) considered that the dream could solve intellectual problems.

6. The ethical feelings in dreams. Two views were presented:

a. Morals do not exist in dreams e.g. Jessen (1856) stated that man has no conscience in dreams e.g. he thinks nothing of murder (Also: Radestock, 1878; Volkelt, 1875).

b. Morals do exist in dreams e.g. Schopenhauer (1851) believed we act and talk in character (Also: Haffner, 1884; Hildebrandt, 1875).

Freud commented that those held the latter opinion were careful not to accept full responsibility for their dreams.

c. Other points

Hildebrandt (1875) said the dream allows us to glance into the inner recesses of the mind. Kant believed the dream existed to lay bare for us our hidden dispositions and to reveal to us not what we are but what we might have been if we had a different education. To Radestock (1878) the dream often only reveals to us what we do not wish to accept to ourselves. Hildebrandt (1875) thought that inhibition slackens on entering sleep, so the dream shows our real nature. (Also: Spitta, 1892). Maury (1878) stated that the dream reveals a repressed immoral disposition of the dreamer. Stricker (1879) said if we are afraid of robbers in a dream, the robbers are imaginary but the fear is real.

7. Dream theories and functions of dreams

Various loose groupings of theories existed:

a. Full psychic activity in dreams e.g. Delboeuf (1885) believed the mind to operate in an undiminished way during sleep. This view says nothing about the function of dreams though.

b. Partial psychic activity in dreams The 'ruling theory of the time' subscribed to this view (i.e. the dream occurred in a partial waking state.) Binz (1878) believed that sleep was caused by fatigued albumen in the brain. In the morning parts of the brain were operating but others not; this was the dream state. Binz, like Maury, considered the dream to be useless.

c. Other 'extant' ideas Robert (1866) gave the dream a function: a physical process of elimination or excretion of useless thoughts.

Delage (1891) noted that we do not dream of significant events of the day, and thought that they had not yet been psychically adjusted. He also believed that strong impressions which had been accidentally repressed were the subject of dreams. The function then was to solve psychic tensions. The same author though supported the 'partial psychic activity' theory of dreams.

Burdach (1830) thought the dream had a refreshing function, allowing one to indulge in free play (Also: Purkinge, 1846).

Freud (1961) stated that a far reaching and original attempt to explain the dream was given by Scherner (1861). He stated that decentralisation occurs in sleep so fantasy dominates. It builds on waking memories and has to depict thoughts in symbols. The material is largely derived from sensory stimuli but this material is subservient to the fantasies. The fantasy plays a game with stimuli and represents the organic source by symbolism. Thus, the body is represented by a house, the lungs by a stove, the penis by a clarinet, pubic hair by fur, the female thighs by a narrow courtyard, and a vagina by a slippery footpath. However, Scherner could ascribe no useful function to the dream.

8. The relation between dreams and madness

a. Etiological and clinical relationship Hohnbraum said that the first attack of insanity often originates in an anxious and terrifying dream.

b. Changes to the dream in madness A person recovering from insanity may be normal in the day but the dreams contain insane themes.

c. The inner relationship between dreams and psychosis Kant stated that 'the lunatic is a dreamer in the waking state'. Maury noted links between the dream and madness: the suspension or retardation of self-consciousness, the combination of ideas by association, changes in personality.

Radestock (1878) said most hallucinations involve sight and hearing, and pointed out that fever patients often have hypermnesia. He also commented that wish fulfilment characterises both dreams and madness.

Obviously, many ideas which people often believe were attributable to Freud (e.g. symbolisation, repression, hypermnesia, childhood memories, falsification, dramatization, associations, day residues) already existed at the end of the 19th century.

IV.5 FREUDIAN DREAM THEORY (Freud 1900, 1961)

The previous section demonstrated that much of what Freud wrote on dreams was built on the ideas of earlier writers. Freudian dream theory ties in with his conceptualisation of personality which involves a tripartite structure: the unconscious Id, seeking gratification of basic (primary) instincts, especially sex and aggression; the conscious Ego in contact with the real world and aware of society's restraints; the Super-ego which reminds the person how one ought to behave. In sleep the Ego is absent, so the Id (like Plato's wild beast) obtains vicarious gratification via dreams. Freud considered the dream to be 'the Via Regis (Royal road) to the knowledge of the unconscious in mental life'.

Freud (1961) stated that dreams have a meaning and that they are wish-fulfillments. Those are ancient ideas, but Freud added the important notion that dreams represent disguised wishes. Another idea of his was that dreams guard (i.e. maintain) sleep. Dealing with this latter point first, he believed that the organism basically seeks inactivity and so the function of dreams was to divert the irritable wishes of the Id by allowing illusory satisfaction. In that way the organism need not rouse and expend energy.

In order that the Ego and Super-Ego should not be shocked by a direct display of gratification of blatant sexual wishes, the dream had to achieve this via symbolic subterfuge. Therefore a discrepancy exists between the reported dream (manifest content) and the underlying, lascivious, dream thoughts (latent content).

It is the function of the dream-interpreter to analyse the dream by tracing the antecedents by a process of free-association. People have different personal associations so no single interpretation can be applied to everyone. However, certain universal symbols in the dream (which Freud claimed could not be traced back) can have specific meanings. Thus, birth may be represented by water , male genitals by the number 3, the penis by machinery, sticks or serpents, female genitals by pits, caves, bones, landscapes, chests, pubic hair by woods or thickets, masturbation by sliding or gliding, (etc.).

Dreams arise either as a direct suppressed instinctual impulse from the Id, or a conscious (Ego) desire persisting from the day. The basic, repressed, dream-thoughts are transformed into acceptable images by the 'dream work' mechanism, which seeks to evade a hypothetical censor of the Super-ego. A process of 'secondary elaboration' or revision (whereby the person attempts to make sense of the strange symbolism and associations) may cause further distortion, in reporting.

Freud was adamant that there were no intellectual operations in the dream work: it was merely a translating device. Thus, when a person dreams of performing a calculation, or thinking, or making a judgement, one has only dreamed of doing such a thing. The relevant point for analysis is, for instance, 'I made a judgement'.

Material for the dreams consists of recent memories, including trivial incidents, and previously forgotten experiences obtained by hypermnesia. The dream may be instigated by: a recent significant event which is directly or indirectly represented in the manifest content, or some basic repressed wish which has been aroused by some association with a recent trivial event.

Freud accepted that somatic stimuli can be incorporated into dreams, although they are woven into a theme where there is a basic instinctual wish. The external stimulus is represented in such a way as to maintain the dream. Thus, an alarm-clock can become a telephone which does not have to be answered.

Some other Freudian notions are: that all the dreams in one night are supposed to centre on the same latent dream thoughts; dream distortion is not always necessary since the dream of the death of a loved one may in fact simply state that unrecognised wish; often, significant fragments of dreams are repressed but may emerge in psycho-analysis.

Freud had the greatest difficulty explaining anxiety dreams as wish-fulfillments. He pleaded that the dream work may have been incompetent so that direct latent material is presented , or that the fulfilment of the wish in itself provokes anxiety, or that the censor has been overpowered by strong Id forces.

Definite statements about affect in dreams were made. It is always toned down in the manifest content due to inhibition , or the cessation in sleep of the forward movement of energy from sensory to motor regions, or by censorial measures. However, the nature of the affect remains the same in both latent and manifest content - except in an inversion situation when it could represent the contrary (The ancient concept of 'opposites'.)

Apart from symbolization other dream work mechanism are condensation, dramatization and displacement: condensation fuses different wishes in the latent content so forming odd composites, the multiplicity of latent thoughts was termed 'over-determined'. So, a dream-person might be observed consisting of the traits of several different people. The important factor to the interpreter is what these people have in common. Similarly, names may be combined, joining two or more persons with something in common. The condensation process can also demonstrate similarities, agreement or identity between elements in the latent content. A suppressed wish for two people to resemble each other may be represented by a composite person.

Spitta's (1892) notion of dramatization (or representation) was employed by Freud. This is where thoughts or concepts are expressed in visual images and the whole is like a theatrical production. Logical connections between dream thoughts may be represented by the synchronous appearance of the elements concerned (i.e. in the same dream).

Causal connections between dream thoughts could be represented by an introductory dream followed by a main dream, or by a scene gradually changing into another. Conflicts between dream thoughts might by the process of opposites represent them as fused. Reversals greatly aid disguise, thus a woman dreaming of a child wading into the sea and drowning may be expressing a birth wish.

A further disguise device is displacement (or transference) where significant elements are transferred to an apparently trivial feature. This transposition also occurs with affects, so that powerful affect may be focussed on some insignificant object (as with, for example, a neurotic phobia). Displacement is supposed to explain much of the superficial bizarreness of dreams.

Many criticisms have been made of Freudian dream theory. At a very basic level, Popper (1959) considered that psycho-analytic theory, including dream theory, was a myth - that it was too easily verifiable but not readily falsifiable. Eysenck (1953) thought Freudian views unscientific since they are based on unverifiable metapsychological propositions. By today's standards Freud himself was unscientific in that he did not quantify data, used no Control groups and simply relied on his memory for statements made by patients. The concept of reaction-formation (by which an instinctual wish can be expressed by its exact opposite) makes the theory 'slippery' and hypothesizing difficult for experiments. Kline (1972) however, in a review of experiments bearing on Freudian theories, claimed that several empirical propositions were supported. Some of the studies regarding dream theory will be examined here.

Symbols are supposed to be present in dreams according to Freud, but they can also be expected in waking life since they reflect the operation of the unconscious mind. Hammer (1953) used a test of symbolism supposedly representing castration anxiety on a group of 20 male subjects who had been sterilised, and compared them to a similar-sized group of Controls who had undergone other operations (the E group was of lower intelligence though). Each person was given the HTP test (Buck, 1948) - in which the subject draws a house, tree and person - before and after the operation. The test is claimed to provide a measure of genital symbolism in that a person with castration anxiety should, say, omit the chimney (a phallic symbol), show a felled tree, or draw a person with no head. Using Fisher’s exact probability test the E group showed significantly more castration anxiety than the Controls, and significantly more than before the operation. The concept of symbolism was therefore supported by Hammer’s study.

Mc Elroy (1954) found, using Scottish children, that females preferred 'male' (pointed) shapes and males preferred rounded shapes. This was perhaps rather too simple an experiment though, as different associations for the sexes could explain the findings. Jahoda (1956) replicated the study in Ghana, where children are less repressed sexually, and found sex differences in 5 out of 12 items.

According to Freudian theory, in psychopathy, repressed primary process material should be nearer consciousness than in normal Subjects. Early work did support this (Starer, 1955). However Moos & Mussen (1959) using matched groups, found that psychotics, neurotics and normals all attached genders to symbols better then chance (10 males were used in each group to assign a gender to certain psycho-analytical symbols). In fact though, from the Freudian viewpoint, perhaps the psychotics should be much superior at symbolism. So the finding might be said to support symbolism but not necessarily Freudian theory.

Cameron (1967) used 2000 children aged 3-17 in a study where they had to state their preferences for symbolic representations of the genitals. He found that children under 4 (Freudian oral / anal stage) showed no preference for male or female symbols; those between 4 and 6 (phallic stage) preferred shapes of the opposite sex; those between 7 and 12 (latency period) preferred symbols of the same sex; and those between 12 and 17 (genital stage) preferred symbols of the opposite sex. The chi-squares supporting these findings were small though. The results do give support to the Freudian concept of symbolism and psycho-sexual theory , but the latter is of somewhat dubious validity (Kline 1972).

Hall (1953, 1966) got Subjects to record their dreams and so collected over 10,000 (manifest-content) reports. He claimed that the dream represented conflicts in the dreamer. Interpretation (without recourse to unconscious meanings) involved examining a series of dreams. His data has been used to test Freudian hypotheses:

According to Freud, the dream of being attacked represents the fear of castration by the father, and the dream of falling means the fear of losing maternal affection (Freud, 1940). Hall (1955) asked Subjects whether they had these dreams, which was the more unpleasant, and which parent they found it easier to argue with. Results were contrary to Freudian theory in that females who had only one of the dreams had a greater incidence of dreams of attack. Also, males with only one dream had more dreams of falling. Hall pointed out that the findings were congruent with Freudian theory if one assumes that the dreams do not represent fear of the action but rather the action itself. So, he argues, a woman has more dreams of being attacked because she thinks she has been castrated. A man dreams more of falling because in the dream he is castrated and so exhibits femininity - which Freud characterised by passive aims and masochism (Freud, 1931), and a sense of inferiority (Freud, 1926). Hall's post hoc reasoning though is scientifically questionable.

Hall (1963) hypothesized from Freudian oedipal theory that there should be: 1. More male strangers in dreams than females. 2. More male strangers in male dreams than in female dreams. 3. More aggressive encounters with male strangers than female strangers. 4. More such encounters in male than female dreams. 5. More free-associations of fathers and authority figures to male strangers in dreams.

He found that the first 4 statements were supported (at or above the 5% level) and the last 2 were marginally supported.

Hall & Van de Castle (1963) hypothesized that males would have more dreams on a castration-anxiety theme than of castration-wish or penis-envy. The opposite would be true of females. Castration-anxiety was supposed to be symbolised by e.g. injury, defect of the body, loss of any object, inability to use the penis (or symbol thereof) and any femininity. With castration-wish, these themes should apply to another in the dream. Penis-envy was envisaged to be reported by acquisition of a penis or symbol, admiration of a man, or acquisition of masculinity. The results of the experiment supported the hypotheses at a highly significant:

On the topic of wish-fulfillment in dreams Lee (1958) studied 600 rural Zulus (uncontaminated by knowledge of Freudian or Jungian theories - although Experimenter bias is still possible). In Zulu society women who do not produce children are treated with contempt. Lee found that infertile women experienced more 'baby' dreams. Also, pseudocyesis was common, and sufferers tended to have direct dreams of babies. Thus the notion of the dream as representing a basic wish gained support from this study.

Fisher & Dement (1963) argued that REM sleep permitted Id discharge and so any deprivation should lead to psychotic symptoms. A need to dream was hypothesized (Dement, 1960). However, Dement (1963) later stated that this could not be so, as among other arguments, lowly animals also had REM sleep. Further, in man, mono-amine-oxidase inhibitor drugs abolish REM with no significant psychological effects (Wyatt et al, 197la) Thus, it seems there is no need to dream, and perhaps not even a dire need for REM sleep.

Penile erections have been observed in REM periods (Fisher et al, 1965). However, these are not necessarily linked with dreams since erections can get out of phase with REMPs by waking Subjects in REM (Karacan et al, 1965). Nevertheless, the cyclic erection could conceivably be affected by REM content e.g. a detumescence could occur in an anxious dream. Karacan et al (1966) tested that hypothesis using 16 Subjects, each spending 6 nights in the sleep-lab. Dreams were Subjectively rated for anxiety on two scales (Gottschalk Scale, Nowlis Check List), and a measure of penis size was obtained. Eighty percent of REMPs were accompanied by erections. The Gottschalk score linked with erection size indicating that penile size is related to the dream content - although recent ejaculation does not affect the erection.

Dement & Wolpert (1958) found that various external stimuli (i.e. tone, water-spray, light) were incorporated into dreams on some occasions. Also, Berger (1963) obtained evidence that names could be woven into dreams when spoken to the Subject in Stage REM. The incorporation was by assonance, association, representation or was direct. Both these studies might be said to support the Freudian idea that the dream guards sleep - or rather REM sleep (since the effects are not observed in NREM).

Foulkes & Rechtschaffen (1964) studied the effect of a violent T.V. film, seen before sleep, on dreams, compared to a non-violent film on Control nights. Dreams after a violent film were not more violent or unpleasant, but dream reports were longer, more clear, more imaginative and more emotional. Hardly any incorporation of the film occurred.

Dement (1963) found that anxious Subjects in the sleep-lab on the first night, miss more REM than non-anxious persons. Altshuler (1966) considered this to be evidence that psycho-analytic theory is not supported, since greater anxiety should result in more dreaming.

This author feels that it is important to consider the historical perspective when appraising tests of Freudian dream theory. A vast amount of what he wrote about dreams had already been stated, even in some cases, for millennia. He pieced together disparate findings and attempted to link them into a unified theory. Many of the elements of this fusion probably have some truth in them (e.g. symbolisation, wish-fulfillment) as they have been observed over many generations and in several different cultures. To test these elements and claim to be testing Freudian theory is not necessarily a correct assumption. The overall metapsychology could be erroneous. For instance, his assertion that symbols disguise repressed sexual wishes could be true, but it could also simply reflect a primitive visual-symbolic 'mentation' in dreams (like the autosymbolic phenomenon of Silberer, 1909), with no ulterior motive. Evidence then of symbolisation is not, per se, evidence for Freudian theory.

Hall’s psycho-analytic explanations concerning strangers in dreams seems to be unnecessary to this author. Men perform more social interaction with strangers in everyday life, surely, and so the findings can be understood in terms of our ordinary patterns of behaviour. The Hall and Van de Castle study could, too, merely illustrate that man does suffer more injuries in his life anyway.

The finding that the erection cycle can be shifted from REM sleep to

NREM (Karacan et al, 1965) is not supportive of psychoanalytic theory. Since dreams are supposed to be highly sexual at base, the autonomic erection should be present. Findings of dream anxiety causing detumescence are not so important as the fact that erection may be transferred to a different sleep state.

Thus, in summary, great care must be exercised in evaluating evidence for Freudian dream theory - the basic propositions of which may be un-testable.

IV.6 JUNGIAN DREAM THEORY (Fordham, 1953)

Jung was an erstwhile disciple of Freud, but objected to the pan-sexualism of his approach and so broke away to establish his own school of psychology. He saw the psyche as self-regulating. A form of general energy, the libido, flows between two opposing poles of personality - the opposites. We undergo a process of individuation in life, which involves the reconciliation of these opposing trends in our nature. Thus, the unconscious can be vastly different from the conscious persona. However, the unconscious is not a repository of repressed instinctual desires, as in Freudian ideology, but can be a guide and adviser of consciousness. The means of communication for the unconscious is via dreams, visions and the like. Thus, dreams are the 'voice of nature'. They have a compensatory function attempting to display any one-sidedness in our nature, so that steps might be taken to remedy this. A wicked person is supposed to have highly virtuous dreams, and vice versa. The dream then is a means of information and control.

In Jungian dream analysis, a series of dreams is investigated. The dream itself is treated as being important rather than the distant associations away from it. A recurring theme indicates a wrongly interpreted dream. Amplification is Jung's process of directed associations (in contrast to free-association). The analyst keeps the associations centred on the dream, but associations of both patient and analyst are considered. In the therapeutic situation, the first dream is believed to be significant, as it reveals underlying attitudes regarding the treatment. In the method of dream-resolution, the patient's present conscious situation is assessed, recent events are noted, and the subjective content of the dream is recorded.

The structure of the dream, said Jung, is like that of classical Greek drama. The time, place and persons involved is first dealt with. Then, there is the exposition of the dream problem, which is followed by the peripety where the plot is woven and a crisis develops. Finally, in the lysis stage, the necessary solution is indicated. Jung believed that dreams having no lysis could mean that actual death was imminent for the dreamer.

Apart from the compensatory factor, dreams may also be prospective - anticipating future conscious events and performance, like a preliminary exercise. This function is in total contrast to Freud, where dreams constantly hark back to infantile sexual wishes. Dreams may revert to the 'land of childhood' which was a period when consciousness had not separated from the 'Collective unconscious'. Natural instincts are supposed to be lost at separation, but if life becomes difficult, one may wish to return to a time when the unconscious gave directions. Jung believed that modern man has forgotten that the unconscious is autonomous - it should be taken heed of.

A few experiments have been conducted either to test Jungian theory, or the results of which can be related to Jungian concepts. Concerning the major function of dreams as being compensatory, the hypothesis can be deduced that introverted persons should have extraverted dreams, and vice versa. Sarason (1944), using 25 mentally retarded females as subjects, noted that TAT (Thematic Apperception Test) themes and dream reports were very similar - a finding that is contrary to Jungian theory.

Gordon (1953) performed a similar study using 29 psychiatric patients, and despite 11 / 42 significant positive correlations on various dimensions, believed that compensation does occur in dreams.

Rychlak & Brams (1963) used the MMPI (Minnesota Multiphasic Personality Inventory) and the EPPS (Edwards Personal Preference Schedule) on 41 College students and compared these scores with the presence or absence of certain themes in dream reports. Dream reports and personality measures tended to centre on the same themes, so not supporting Jungian theory.

Robbins (1966) used 32 students and compared dream association ratings with EPPS scores. 3 / 11 dimensions common to both measures gave significant positive coefficients of correlation. Brender & Kramer (1967) gave TAT cards to 13 subjects who later slept in a sleep lab. Seventy-eight TAT stories and 34 dream reports were rated on 20 need dimensions. Four of these (defence, sentience, affiliation, play) provided significant positive correlations, and only 1 (dominance) gave a negative coefficient.

In a test of Jungian theory Palmiere (1972) administered, to 114 students, the Myers-Briggs Type Indicator and selected 25 at each end of the scale of Introversion / Extraversion. Six TAT cards were administered, with questions on personality characteristics of persons in the stories. Fantasies of extraverts should have shown more repressed introversion and vice versa. On the contrary though, introverts chose significantly more introverted responses.

Finally, Domino (1976) obtained dream reports from 62 students, which were rated on 15 personality dimensions and compared with scores on the same dimensions as measured by the EPPS and ACL (Adjective Check List). Six EPPS scores and 10 ACL scores correlated significantly, and all positively. It therefore seems that the notion of compensation in dreams, a major element in Jungian dream theory, is not supported by experimentation.

One criticism that might be made of Jungian dream theory is the matter of why the compensatory message has to be so subtle. Why should not a direct thought occur in the dream or when awake that 'I am too one-sided in my nature' ? It is rather like the Roman belief that dreams were messages from the gods. The rebellious Cicero asked, 'Why if the gods can warn us of impending events in dreams, should they not do so when we are awake ?' (MacKenzie 1965, pages 52-55).

IV.7 RECENT IDEAS ON DREAMS.

Some notions on the possible functions of the REM State in the overall context of sleep were discussed in Chapter II. Often though, any psychological significance of the dream is given little consideration. The view is reflected in such recent ideas as that where the dream is seen as a mere by-product of memory organizational processes (Evans & Newman,196k) or where the dream is said to be produced by the initiation of PGO spikes caused by the release of monoamine a at the pontine part of the brain stern (Jouvet, 1967). Other writers however, have continued the long-standing opinion that dreams are of psychological import and have developed their own systems of belief (e.g. Adler, 1958; Fromm, 1949; Hall, 1953; Ullman, 1962).

Evans & Newman (1964), treading on the dangerous ground of superficial analogy, proposed that dreams serve as a ‘memory filter’ rejecting redundant memories and responses - process that must occur in computers from time to time when programs are updated. They point out that human memory traces are adaptive to new situations. Computer programs too are evolved and redundant material is removed ‘off-line’ so as not to affect on-going processing. Old memories are not erased, they assert, since they may ‘come in useful one day’, but links between memories are modified in dreams. If the activity is prevented ‘breakdowns’ can occur. Short re-routing of several items can be reflected in ‘non-sensical’ dreams whereas modification of lengthy ‘programs’ would result in long ‘sensible’ dreams.

Repeated dreams would result from constant interruptions in the modification process ef certain memories. The theory appeared at a time when it seemed that a ‘need to dream’ existed. That view however has not prevailed and consequently the theory has been left rather high and dry.

Jouvet (1975) suggested that dreams are products of cortical stimulation arising from PGO spikes. His ideas are based on extensive neuorophysiological studies of cats. He has found that PGO spikes occur under the control of a 'pace-maker' in the lateral part of the pontine tegmentum in the region of the nuclei pontis oralis and caudalis (Laurent et al, 1974). Rapid ocular activity in Stage REM sleep is synchronised with PGO spikes. The spikes are seen to occur continuously after pharmacological effect on (using reserpine or para-chlorphenyl-alanine), or lesion of, the raphé nuclei (which results in a decrease of 5-HT). An inhibitory control operates normally to suppress PGO immediately on waking and this appears to be due to the activation of nor-adrenalin neurons. Another observation by Jouvet is that stereotaxic bilateral destruction of the caudal part of the nucleus coeruleus selectively suppresses the powerful motor inhibition of Stage REM. Cats with this lesion evince 'pseudo-hallucinatory behaviour' at REM times (Jouvet,1975), acting out aggressive and other instinctive behaviours. In Stage REM then, massive muscular inhibition and the raising of sensory thresholds effectively stop any input or output, so most neurons can receive only endogenous information coming from the pons. This process can only occur when the organism is asleep, hence Jouvet states that sleep is the guardian of dreaming (A direct reversal of Freud's dictum). He also thinks that the period of sleep following dreaming may be important for the integration of information since a correlation exists between Stage REM duration and the following sleep period (Ursin, 1970). Another observation of Jouvet is that REM sleep appears most in the organism in utero and at birth, so it must play some important maturational function then.

then. Two kinds of processes seem to occur: The first (e.g. maturation of the visual system) appears to possess a critical-period and depends upon stimuli from the external milieu. The second process seems to constitute a programmed genetic readout as a function of prior epigenetic events. Here, REM sleep programs or organises the integration of all the complex motor sequences necessary for genetic behaviour (instincts). Jouvet considers this to be the function of REM sleep, under the possible control of PGO activity. In adults, modification due to learning occurs to the neuro-system, however it is at this stage a rather redundant process, as total inhibition of REM can be seen by MAO-inhibitors or ά-methyl DOPA drugs.

Hartmann (1973) suspects that dreaming sleep has a function independent of dreams. These are mere concomitants or indicators of brain processes. Thus, superficial ‘condensation’ could result from circuit connections being tested or formed - especially in the cortical areas served by ascending catecholamine pathways. Hartmann points out that a single, short stimulation of the cortex can lead to a whole story of events which unfolds over several seconds or minutes (Penfield & Jasper,1954). From another approach, Hartmann pondered on what is not in the dream. He notes for instance that emotions are more primitive in dreams and that the dreamer seldom feels fatigued, that free-will is absent (except in lucid-dreams). In addition, emotions change rapidly, attention is limited and reality testing is minimal. Hartmann suggests these systems are ‘shunted out’ during the repair processes of REM sleep. The lack of a ‘continuing sense of self’ he states is the most prominent characteristic of post-lobotomy patients (Robinson & Freeman, 1954) - having of course much cortical disconnection. This situation permits the more primitive ‘primary process’ activity to be reflected in dreams.

primitive 'primary process' activity to be reflected in dreams. The changes in dreams during the course of the night could indicate processes occurring at different levels of the brain.

Some major psychological viewpoints on dreams will now be considered. Adler (1958) proposed a theory of dreaming which is not as detailed as Freud's but presents a very different approach. Mainly, he believed that sleeping and waking thoughts were similar, only there is some relative deficiency in sleep. Therefore he disagreed with Freud that the Unconscious was important in determining dream thought and that a dichotomy between Consciousness and the Unconscious existed. Sex and aggression do not generally dominate waking thoughts so they would not do so in dreams. However, like Freud, Adler believed that dreams occur when one is troubled by some unresolved problem in waking life. He also recognised the presence in dreams of such mechanisms as condensation, displacement and symbolisation. The symbol he saw not as a disguise but as a simple expression. Adler considered day-residues to be more important than Freud since they represent waking troubles. The dream though, fools the dreamer over the resolution of the problem. Ullman (1962), though, pointed out that this notion is somewhat contrary to Adler's insistence that the dream and waking thought are similar. His ideas provided groundwork for the later opinions on dreaming of such theorists as Fromm (1951), Hall, (1959) and Ullman (1962).

Fromm (1951) rejected much of Freud's dogma. He thought that in sleep our frame of reference changes drastically from waking concern about survival and mastering the environment to an inner world concerned exclusively with ourselves. This contemplative state can also be attained by a waking person by focusing on inner experience. The logic of the dream world is entirely valid for that situation. Symbolic language is employed but in Western culture this comprehension has atrophied. Dreams are therefore remnants of this mode of expression. Fromm believed that in dreams we are no longer exposed to cultural pressures and can therefore become aware of what we really feel and think. Thus, true insights and value-judgements may be experienced in dreams as well as immoral wishes. He saw the 'low' (Freudian) and 'high' (Jungian) aspects of the dream as dogmatic restrictions and thought either side of the dreamer's character can be expressed.

Hall (1953) obtained a total of 10,000 samples of reported dreams from a normal population. The most frequent settings were: part of a building (24%); a conveyance (13%); a whole building (11%); place of recreation (10%); street or road (9%); shop (41%); classroom (4%); office or factory (1%); miscellaneous (14%). In the first named setting the most common rooms in the dreams were in order the living room, bedroom, kitchen, stairway, and basement. Hall saw the most outstanding feature of these settings was their commonplaceness. Bizarre and unfamiliar settings are seldom dreamed about. However, the settings do not mirror our daily lives since places of work have a lower frequency in dream reports. In addition, recreational settings are higher than in real life. As to the characters appearing in dreams, Hall divided his Subjects into 2 groups. The younger group (18-28) produced 1,819 dreams. In 15% of cases only the dreamer was present. In the rest the average number of persons in the dream was 3 including the dreamer. Forty-three percent of the characters were strangers, 37% were friends or acquaintances, 19% were family members or relatives and 1% were famous relatives and 1% were famous persons. The dreamer's mother appeared most frequently (34%), then the father (27%), brother (14%) and sister (12%). Men dream twice as often about males than females but women dream equally of both sexes. Also, people generally dream of persons of their own age group. Older persons (30-80) generally showed little difference, but dreamed more of younger persons. Hall generalised by saying that children dream of their parents, and vice versa, and husbands and wives dream of one another.

Regarding actions in dreams, Hall found the following frequencies for different categories: walking, running, riding, etc. - 34%; talking - 11%; sitting – 7%; watching – 7%; socialising - 6%; playing – 5%; manual work - 4%; striving - 4%; quarrelling and fighting - 3%; acquiring - 3%. Flying and floating were not observed to be frequent dream activities. Hall summarised these findings by stating that 'dreamers go places more than they do things; they play more than they work; the activities are more passive than active'.

An analysis of 1,320 dreams provided information on the relations between the dreamer and the other characters. Most acts were hostile (388 to 188). Of these, the behaviour was: Murder – 2%; physical attack – 28%; denunciation – 27%; feelings of hostility - 8%. Emotions felt in dreams were: apprehension – 40%; anger, happiness and excitement – 18% each; sadness - 10 %. Thus, 64% of emotions were unpleasant and 18% pleasant. Strangely, though, most dreamers judged dreams more often pleasant (41%) than unpleasant (23%). Hall could find no special characteristics of coloured dreams. In 3,000 dreams, 29% were coloured (31% females, 24% males).

Armed with this data from typical ordinary people, Hall (1953) propounded his ideas on dreams. He believes dreams can provide self-knowledge and that they may be studied to ascertain what a person thinks about during sleep. The dreamer's problems and conflicts are experienced in the dream, portrayed like a theatrical production. On the matter of sex-dreams Hall stated that nocturnal emission shows 'unmistakably' that the dream is sexually motivated. However, this may not be so: Excessive sexual arousal (linked with erection in Stage REM) caused by some physiological instability could perhaps produce an orgasm. The dream content is not always sexual in such dreams and in that case it is not necessarily symbolic.

Hall gives 4 rules for understanding dreams. Firstly, that the whole theatrical effect of the dream is a creation of the dreamer's mind. It provides a picture of subjective reality. Secondly, that nothing appears which the dreamer does not put there. Therefore the dreamer is best able to interpret the dream. Thirdly, that several conceptions of the dreamer's self, or others, may be revealed. Fourthly, that the dream is an organic unity which needs to be interpreted as a whole. As for symbols in dreams, Hall believes they do not disguise but are merely expressive devices as occur often in waking life (e.g. a lion represents courage). However, his notions generally appear to accept Freudian dogmas such as the Oedipal complex and the omnipresence of sex and aggression in dreams.

Essentially he sees the dream as providing information about

the dreamer's concept of self, other people, the world, driving forces, and conflicts. Five major conflicts develop in life:
The child and its relationship with the parents; the freedom-security conflict of childhood and adolescence; the inherent bisexuality conflict; the moral conflict between biological and sociological feelings; the biological life/death conflict. The dream reveals the person's feelings on these topics.

Ullman (1958, 1962) came forward with his own views on dream consciousness. He agreed with several statements of Adler: His criticisms of Freudian theory; the emphasis on the possible relationship of the dream to the life-style; his emphasis on the dreamer's orientation to the future. Ullman agreed partially about Adler's notion of the use of metaphor in dreams as a device for stirring up feelings regarding an aspect of the dreamer's current life situation. He believed that the crucial quality of the dream is its capacity for revelation rather than concealment.

In modern dream interpretation, dogmatic assertions are being generally abandoned and a mixture of techniques and beliefs are often employed. For example, Faraday (1972, 1974) encourages the recording of a dream diary and a discussion, when awake, between the dreamer and any dream character to determine more about the character (A method employed by the Gestalt therapist Frederick Perls). She states certain rules for dream interpretation:

1. The dream should first be taken literally, as it might be a reminder or warning.
2. If it makes no sense taken that way, the dream should be seen as a metaphor.
3. Recent events trigger the dream.
4. The feelings in the dream are a good guide to the particular problem.
5. Dream themes must be interpreted individually to suit the dreamer's

particular life experiences and circumstances.

6. A dream theme can represent different meanings on different occasions.
7. The dream points to something that requires attention.
8. The dream is understood only when it makes sense to the dreamer.
9. If the dream is incorrectly interpreted the dreamer is unimpressed by the interpretation.

Faraday appears to particularly seek out puns in dreams. These may take several forms: Verbal, (gilt - guilt); reversal, (filling full - fulfilled); visual, (baseball game -'base game'); proper name, (long johns - Long John Nebel); colloquial metaphor, (shooting me down); literal, (bare chest - getting something off one's chest). Faraday thinks dreams are of 3 basic types: 'Looking outward,' providing information about the external world - often triggered by subliminal perceptions; 'through the looking-glass', expressing our subjective attitudes to the external world; 'looking inward', giving a picture of our feelings concerning our inner world. The dreamer may seek help from the dream itself in an interpretation by asking it to provide a meaning to a previous symbol. Faraday encourages group co-operation in dream analysis, to reduce reliance on the psychotherapist and prevents the therapist's personal values from being thrust upon the patient.

This author would comment that since the various dream-interpretation Schools have all claimed to provide the true and only method, and as each can give voluminous testimonials, perhaps the dream in fact is fairly malleable and simply reflects the person's conscious biases (or the therapist's) regarding dreams. Since there is no physiological need to dream they need not be messages of great psychological import. In addition, the various physiological accompaniments of dreams may not be the result of psychological activity, overt or suppressed. Random changes in physiological arousal might cause psychological effects. Nevertheless, the choice of particular images is surely highly personal to the dreamer and inasmuch their study may be revealing. Therapists assume that some great truth from an all-knowing part of the mind is at the base of the dream and that the dream is the only channel of communication (i.e. It is a special state having unique qualities). This author is reminded of his experience with 'hypnotic dreams (Hearne,1973). It was found that similar productions could be obtained without hypnosis. This might be true of nocturnal dreams also. Perhaps the person need only relate an imagined dream in the waking state.

Thus, despite millennia of dream interpretation, the dream remains essentially a mystery. No one can prove that a particular analysis is the correct one; no one can scientifically demonstrate that the dream even conveys a previously unrecognised, important, psychological message - although the cases of creativity in dreams indicate the presence of some complex mental activity during that state.

IV.8 CREATIVITY AND DREAMS.

Creative people are said to have more imaginative dreams. Adelson (1957) reported that 8 College girls in a creative-writing course had far more exotic dreams than 7 'uninventive' Subjects. Similarly, Schechter et al., (1965) administered creativity tests to 105 students who also kept a dream diary. The Arts students had significantly more recall of dreams than Science students, and a significant positive correlation was found between dream imaginativeness and creativity test score.

Numerous important artistic works and scientific discoveries have emerged from the dream state. Neils Bohr's dream of a solidified sun with its planets gave him the concepualisation of the atomic model (Krippner & Hughes, 1970).
The Nobel Prize-winning pharmacologist Otto Loewi discovered that nerves affect the heart-beat via an intermediary chemical after a dream suggested the experiment. He wrote the dream down but could not decipher it the next morning. That night the dream recurred and he performed the experiment on waking. Cannon (the neurologist), Galen (the physician), Louis Agassiz (the naturalist) all reported scientific discoveries in dreams. Elias Howe, the inventor of the sewing machine experienced a dream in which natives were throwing spears at him. He noticed that the spears had eye-shaped holes near the tip. He woke and realised at once that the dream had solved the problem of where to place the eye of the needle in the sewing machine. James Watt had a recurring dream of walking through a heavy rain of lead pellets. He thought the dream might be indicating that molten lead dropped from a height would form spheres. On test, his idea was proved wholly correct. The chemist Kékulé thought of the ring structure of the benzene

molecule after seeing, in a dream, a snake with its tail in its mouth. He later told a scientific gathering that 'Gentlemen we should learn to dream'. The mathematicians Condorcet and Carden, and the philosophers Al-Mamun and Synesius all had insights in dreams (Krippner & Hughes, 1970).

Among artistic creations, several composers (e.g. Mozart, Schumann, Saint-Saens, d'Indy) reported that themes had been obtained from dreams. Tartini dreamed that the devil played a sonata, but the composer, on waking, could only remember the trill. R.L. Stevenson was able to dream whole stories and even return to them if the end was unsatisfactory. His 'Dr. Jekyll and Mr. Hyde' was the result of a dream where a pursued criminal drank a potion which altered his appearance.

These cases strongly indicate that dreams have great potential in improving the quality of life of mankind.

Having given a general account of Man's historical fascination in dreams and some of the theories which have been proposed to explain them, the next Chapter deals with a particular type of dream - the study of which has been greatly neglected.

CHAPTER V
LUCID DREAMS

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CHAPTER V

V.1 THE PHENOMENON.

There exists a type of nocturnal dream which is not experienced universally and then not usually frequently even in those who do report the phenomenon. It may be described and defined as a dream in which the dreamer becomes aware that the perceived situation is in fact a dream - i.e. one has insight, whilst asleep and dreaming, that one is dreaming. The condition is not usually developed by the dreamer in the form of dream-control, and probably it is typically considered as an interesting trifle. The label 'lucid-dream' has been attached to the phenomenon indicating the presence of lucid thought. At this present time most people and even most psychologists are ignorant of the term 'lucid-dream' and because of individual experiential differences probably some would deny that such a concept is possible. Others might refute their validity on philosophical grounds (see Chapter VI).

During the course of this research the author experienced his first lucid-dream. It was a most memorable event and the following account suitably exemplifies the dawning of critical awareness within the dream:

'I was wandering along on some rocks by the sea-side somewhere. I seemed to think it was by the Mediterranean. People were around and I could hear them talking happily and playing games. I looked down at the sea and noticed it was clear and deep. I moved on and again looked down at the sea. It was shallow here and I thought I could make out some old pieces of metal in the water. This interested me. Next, the sea had gone and I was on the beach digging a small hole which seemed to enlarge automatically. I was then reclining on the sand feeling into the hole and picking out old green-tarnished coins. The visual detail was very good. Suddenly I realised that this was a wish-fulfillment situation (finding money) that I had often experienced before in dreams. I said aloud ‘This is a lucid-dream’. I stood up and looked around me. It was an incredible experience -a wonderful dawning of consciousness. It was a beautiful sea-side scene. The colours were much deeper than normal and the layout was a bit odd. Perspective did not seem to be accurate. There were a few people around, swimming, etc. I noticed a tight -feeling round my eyes at first. I considered making the 8 eye-movement EOG signals as practice but did not do so as there would not be any evidence I had made them.’ (See page 367). A strong association between the easy acquisition of precious coins in dreams and the concept of wish-fulfillment had been established in the author’s mind by several previous post-hoc analyses of coin-finding situations in dreams, The example given was the first time that the perception of coins ‘triggered’ lucidity. (It has occurred again since on a few occasions).

Sometimes lucidity is attained for no apparent reason. The moment of realisation in a dream of subject A.W. exemplifies this:‘It was just an ordinary day - it could have been morning or afternoon. I was just walking along the footpath. I wasn’t really doing anything particularly. I mean, there was no situation really apart from that. There’s no reason I became lucid I know of’.

In a survey of University students Green (1966) found that 73% of the sample answered ‘Yes’ to the simple question: ‘Have you ever had a dream in which you were aware that you were dreaming?’ (70/95 males, 14/15 females). The male/female difference was not statistically significant. The figures may be exaggerated though due to an acquiescence response (Cronbach, 1942; Wiggins, 1962) in persons faced with answering a question concerning a novel concept.

(* An experimental technique described in Chapter VII)

V.2 THE POTENTIAL IMPORTANCE OF LUCID-DREAMS.

In the past, the importance or even the existence of lucid-dreams was not appreciated, perhaps because they are not universally experienced. In addition, no collation of accounts existed and so the phenomenon was not adequately labeled or categorized. However, enough is known about these dreams now to appreciate that they could be a very useful tool for studying not only dreams but other psychological processes such as memory and external perceptions.

Since the Subject is apparently aware of the real situation of being conscious yet in a dream environment, various experimentations can be undertaken, as the habitual lucid-dream writers have indicated. Experiments could be of 2 types:

1. Where the subject performs some predetermined task and observes the result. The observations could concern (a) deliberate manipulation of dream events. A study of what can and cannot be done in dreams might prove interesting psychologically. How is the lucid-dream logic different from reality, and why? Does the lucid-dream represent an earlier stage in the development of homo-sapiens psyche ? (i.e. a 'fossil' consciousness?). (b) Observations of external stimulations i.e. perceptions of stimuli of any sensory modality to see whether and how modifications occur in incorporation.

2. Where the Subject performs tasks or responds to instructions given when dreaming - providing input of verbal material is feasible. Thus, the intelligence, personality, memory, thinking, of the lucid-dreamer could be tested whilst in the dream state. For instance, discrepancies concerning recall could throw light

on memory consolidation and storage. Jung's idea that the dreamer's personality is the opposite to the waking form might also be tested. Another type of study could involve instructing the lucid-dreamer to perform specific actions in the dream to determine the consequences. These and many other experiments could provide a clearer picture of the mind of the dreamer and the nature of dreams.

In all these cases the output of information from the Subject would be assumed to be by verbal report on waking. However, if a system of 2-way communication could he devised, the subject could report simultaneously with the dream event.

At a very basic level too, the fact that dreams really do occur in REM sleep could be shown if the Subject could signal from a lucid-dream and that dream was demonstrably in Stage REM sleep. Other factors which could be established are: whether lucidity persists, whether the temporal order of events in the waking report corresponds to the signaled information, whether there is repression or amnesia concerning signaled matter. From the data obtained from such studies a new theory of dreams, free from meta-psychological speculations, would surely be forthcoming.

V.3 CHARACTERISTICS OF LUCID-DREAMS.

Green (1968) collated questionnaire data and lucid-dream reports, and described the various characteristics of these dreams. These are to be re-stated and commented on.

1. The transitional stage.

Lucidity becomes established at a crucial transitional stage in the ordinary dream, however sometimes the dreamer may debate whether or not the experience is a dream only to conclude, falsely, that it is reality. This error, which may perhaps be due to inadequate critical observation and thought, and/or exceptional verisimilitude of the dream-scenery, prevents the generation of lucidity. Green labels this transitional stage a 'pre-lucid-dream', however that term, because it includes the word dream, is probably best used to describe the whole of the Ordinary-dream matrix, of that REMP, preceding lucidity.

The phenomenon of lucidity-rejection in the transitional stage is somewhat similar to a false-awakening (page 113) after lucidity. In both cases the actual state is not appreciated by the dreamer. The main Subject in this research (A.W.), when in the transitional stage, habitually tests whether it is a dream or not by attempting to fly or float. If he succeeds he knows he is asleep.

2. The onset of lucidity.

Green categorized those dream events coinciding with the onset of lucidity. She listed 4 basic processes:

a. Emotional stress within the dream. This was the most frequent apparent cause of lucidity in naive subjects. Usually the awareness appeared in a nightmare so enabling the subject to wake up.

The sense of familiarity in recurring nightmares apparently sometimes triggers lucidity. Green regards this type of lucid-dream as rudimentary.

b. Recognition of incongruity. Often, the observation of some glaring out-of-place aspect of the dream may be linked with the start of lucidity. For example, van Eeden (1913) remarks on an observation by Prof. Ernst Mach that on one occasion he (Mach) knew he was dreaming because he saw the movement of some twigs to be defective.

c. Lucidity arising from the initiation of analytical thought. Here, lucidity is achieved after dream events lead to intellectual thought about the situation. As examples, see this author's account on pages 96-97, and the following report from A.W.

'When I was running down this path I got caught up with some kind of prickly bush. I knew I was dreaming because when I got caught up first of all I started trying to untangle myself and I thought 'This is one of those stupid things, you get caught up in some irrelevant business and you can't get on with the main thing'. (Taped report)

The distinction between items b and c is surely often very difficult to decide upon, so perhaps this separation is not wholly justified.

d. Recognition of the dreamlike quality of the experience. Green cites a Subject whose poor visual acuity in a dream apparently led to lucidity.

She also sensibly points out that the correlation between a report of, say, incongruity and the initiation of lucidity does not necessarily prove a cause and effect connection.

This author considers that such a rigid classificatory system is premature and perhaps undesirable. If the establishment of lucidity is essentially caused, say, by physiological stimulation of the cortex, parallel dream events may not be linked and any such attempts by the dreamer would be rationalisations.

3. Lucidity starting from a waking state.

Green is apparently prepared to include under the term 'lucid-dream' visual/imaginal phenomena of the waking state. In one type the Subject deliberately attempts to enter a lucid-dream whilst falling asleep. Ouspensky (1960) is cited as the only person who practised this in a 'half-dream' state. He found it easier to observe them though in the morning. This author opines that the falling-asleep 'lucid-dreams' were dreamlets. It is possible to surface lightly and re-enter REM in the later REMPS. Another point is that if the Subject experienced vivid visual imagery, these dreams could have been examples of unusual hypnagogic and hypnopompic imagery. Up to now no electrophysiological evidence has been able to determine whether lucid-dreams occur in REM sleep and are therefore genuine dreams, or are a form of visual imagery occurring in Stage I sleep or even when awake.

4. Flying and lucid dreams.

According to Green, the activity of flying is characteristic of lucid-dreams. Most of the writers of collected accounts of their lucid-dreams mention flying - presumably it is a spontaneously- present dream-skill. The term 'flying' covers many variations in technique. It can include flight by making swimming-type movements, floating, zooming like a rocket, or gliding along just above ground level. When the subject is flying in an ordinary dream the action can sometimes coincide with lucidity - perhaps by psychological association with previous occasions where flying and lucidity were cotemporaneous.

It is interesting to consider why the unreal activity of flying is possible in lucid-dreams. Two different considerations occur to this author. Firstly, it could be that in a lucid-dream primitive areas of the brain are prominent in activity and that the organism in effect reverts to an earlier evolutionary stage. Piscean or amphibian stages in the development of man could thus be expressed - flying being a representation of swimming*.

Alternatively, a lack of muscular feedback with perhaps imaged positive feedback could permit such activity. A control-centre might send signals which are intended to reach the appropriate muscles. These are however inhibited by the natural atonia of REM sleep. Since the muscles are not operated, no signals of effect return and in their absence imaginal positive feedback could presumably occur. Hence, any physical activity is theoretically likely in lucid-dreams - so long perhaps that an overriding psychological assertion in the Subject of impossibility is not present. Subjects have certainly reported, for instance, an ability to pull a finger off and replace it, or to walk through a wall.

Van Eeden (1913) wrote, on flying:

> ‘Flying or floating .... is generally an indication that lucid-dreams are coming. When I have been flying in my dreams for two or three nights, then I know that a lucid dream is at hand. And the lucid-dream itself is often initiated and accompanied all the time by the sensation of flying. Sometimes I feel myself floating swiftly through wide spaces; once I flew back-wards, and once, dreaming that I was inside a cathedral, I flew upwards, with the immense building and all in it, at great speed.’ (Pages 449-450)

(* Ellis (1899) attributes such an idea to Stanley Hall).

5. Physical realism in lucid-dreams.

The lucid-dream environment is reported to be similar to that which we term reality, although not in all respects. Van Eeden had the impression of being in a 'fake-world , cleverly imitated, but with small failures'.

On Sept. 9, 1904, I dreamt that I stood at a table before a window. On the table were different objects. I was perfectly aware that I was dreaming and I considered what sorts of experiments I could make. I began by trying to break a glass, by beating it with a stone. I put a small tablet of glass on two stones and struck it with another stone. Yet it would not break. Then I took a fine claret-glass from the table and struck it with my fist, with all my might, at the same time reflecting how dangerous it would be to do this in waking life; yet the glass remained whole. But lo; when I looked at it again after some time, it was broken. It broke all right, but a little too late, like an actor who misses his cue. This gave me a very curious impression of being in a fake-world, cleverly imitated, but with small failures.' (Page 448)

Green states that lucid-dreams are generally realistic in that, say, animals and objects do not become personified or talk, or change identity during the dreams. However she also gives examples where physical realism does break down. She considers that the dreamer's attitude may be relevant to this matter.

Flying is a common departure from reality in lucid-dreams, and Green also draws attention to tunnel-traveling representing displacement in space and perhaps time.

6. Psychological realism in lucid-dreams.

Green states that persons who appear in lucid-dreams retain their identity throughout the dream. Persons who are unknown to the dreamer are often compounds composed from memories. The lucid-dream world is also somewhat idealised in that deformed or grotesque persons are seldom seen. She also comments that a specific person in the dream occasionally does not resemble that person. Often, the dreamer discusses with the hallucinated person the fact that it is a dream. Van Eeden wrote:

'I saw Prof. van't Hoff, the famous Dutch chemist, whom I had known as a student, standing in a sort of college-room, surrounded by a number of learned people. I went up to him, knowing very well that he was dead, and continued my inquiry about our condition after death. It was a long, quiet conversation, in which I was perfectly aware of the situation. I asked first why we, lacking our organs of sense, could arrive at any certainty that the person to whom we were talking was really that person and not a subjective illusion. Then van't Hoff said: 'Just as in common life; by a general impression.' 'Yet', I said, 'in common life there is a stability of observation and there is consolidation by repeated observations. 'Here also', said van't Hoff , 'And the sensation of certainty is the same.' (Pages 450-451)

7. Perceptual texture in lucid-dreams. The visual detail of lucid-dreams appears to vary within and between dreams although Green believes that complete realism seems to be the rule with habitual lucid-dreamers. The range of quality may be illustrated by the following 2 instances: F. Myers (1887):

'I was, I thought, standing in my study; but I observed that the furniture had not its usual distinctiveness - that everything was blurred and somehow evaded a direct gaze. It struck me that this must be because I was dreaming. This was a great delight to me, as giving the opportunity of experimentation'. (Pages 241-

Subject A.W: In this lucid-dream, a scene-shift occurred. I was among all these suburban houses and so on and I was reading numbers on the gates and then it ran into a scene like the seaside, where there were little shops selling the usual seaside stuff - postcards, buckets, etc. And I was looking around on anything that might have a number on it - bits of advertising and so on'. (Page 377)

One interesting difficulty reported by some Subjects is an inability to focus on reading printed or written material, Oliver Fox wrote:

'In a 'Dream of Knowledge' reading is a very difficult matter. The print seems clear enough until one tries to read it; then the letters become blurred, or run together, or fade away, or change to others. Each line, or in some cases each word, must be held by an effort of will until its meaning has been firmly grasped; then it is released - on which it becomes blotted out or changed – and the next held in its turn and so on. Other people have told me that they find the same difficulty in reading dream literature'. (Page 46)

Sometimes, perceptual detail is extremely good - it must be if Subjects cannot decide whether a situation is a dream or reality. Other sensory modalities are represented in lucid-dreams, as these examples show:

Auditory and gustatory sensation: (Van Eeden)

'I took the broken glass and threw it out of the window, in order to observe whether I could hear the tinkling, I heard the noise alright and I even saw two dogs run away from it quite naturally, I thought what a good imitation this comedy-world was. Then I saw a decanter with claret and tasted it, and noted with perfect clearness of mind: 'Well, we can also have voluntary impressions of taste in this dream-world; this has quite the taste of wine'. (Page '448)

Gustatory sensation: (Subject A.W.)

'I pulled a leaf (I think it was a thistle) - some sort of fairly fat leaf - and tore it in two and tasted it...... it tasted sweet and sappy'. (Taped report)

Green considers that proprioceptive sensation is implied by the reports of some subjects of being aware of the position of their body.

8. Memory of lucid-dreams.

Green states that all habitual lucid-dreamers report their memory of the lucid-dream as being clear. However, interest in the phenomenon probably accounts for a better recall.

9. Memory in lucid-dreams.

Green points out that the ideal way to test memory in lucid-dreams is to test the Subject's responses to certain independent questions. However that is a state of experimental development not yet attained. Subjects have certainly remembered tasks or experiments to perform in lucid-dreams. For instance Subject A.W:

'I looked at my hands and they were definitely unusual. I mean, they weren't my hands. That's what gave me the clue - so it was after that I started doing the experiments. And while I was flying I remembered (because I thought I was a bit behind schedule you see) to, at least think about listening for words coming in - but presumably you didn't send any'. (Taped report)

Van Eeden mentioned the 'nearly complete' recollection of day-life in his dreams:

'In these dreams the reintegration of the psychic functions is so complete that the sleeper remembers day-life and his own condition, reaches a state of perfect awareness, and is able to direct his attention, and to attempt different acts of free volition'. (Page 446)

However, some lapses occur: (van Eeden)

'Then I saw my brother sitting - the same who died in 1906 - and I went up to him saying: "Now we are dreaming, both of us." He answered: "No, I am not!" And then I remembered that he was dead'. (Page 450)

Green is of the opinion that a hierarchy of memories exists in lucid-dreams:

1. 'General psychological reflections and intentions are most easily remembered,

together with generalized information concerning the properties of the physical world'.

2. 'Specific intentions relating to the lucid-dream, and circumstances of fairly long standing concerning his life and circumstance'.

3. 'There appears to be a positive resistance to accurate memories of the most immediate and specific concrete details of the Subject's life.'

She states that concrete details of this latter kind are the only inaccurately remembered items in lucid-dreams.

If true, this is a potentially interesting observation, as it suggests that in the lucid-dream state those areas of the brain dealing with consolidation and storage of recent memories are divorced from the dream-consciousness areas.

10. Analytical thought in lucid-dreams.

From her investigations, Green finds that analytical thought in lucid-dreams is reported not to be faulty - however there is an exception: she states that the relationship between the dream world and real world may be subject to faulty reasoning, where specific details are concerned.

Hervey de Saint-Denys reflected intelligently in his lucid-dreams:

'I even reason as follows: the images which appear to me in this dream are no more imposed upon me than the images which present themselves to my eyes when I am awake. I retain as well as usual my freedom of choice to turn right or left, to direct my eyes in one direction or another, and so on. Indeed, I can summon up certain scenes or produce certain images accordingly as I wish or do not wish to act mentally as a result of what I see... How does the dream differ for me from reality? I remember, I reason, I will, I do not will: I am not the helpless victim of the hallucination in which I am involved. If my acts of volition are not followed by real efforts, this is only because instead of my physical organs obeying my thought, only an image of this process takes place; but the psychological phenomenon is exactly the same'. (Page 85)

Green exemplifies her statement concerning the occasional failure of Subjects to realise the independence of dream and actual world in specific matters by quoting Myers:

'I remembered that my wife and children were away at the time (which was true) and I did not reason to the effect that they might be present in a dream, though absent from home in reality'. (Page 242)

Green states that a learning effect can operate however in this area, so that improvements in reasoning occur subsequently.

11. Emotional quality of lucid-dreams.

The emotional level in lucid-dreams is another variable feature. Green gives an extreme example of Fox:

'I dreamed that I was standing on the pavement outside my home. The sun was rising behind the Roman wall, and the waters of Blethingden Bay were sparkling in the morning light. I could see the tall trees at the corner of the road and the top of the old grey tower beyond the Forty steps. In the magic of the early sunshine the scene was beautiful enough even then.....Then the solution flashed upon me: though this glorious summer morning seemed as real as real could be, I was dreaming!' (Pages 32-33)

One interesting virtually universal finding is that emotional involvement in a lucid-dream can waken the subject. Thus, habitual lucid-dreamers try to avoid certain situations in order to prolong the lucid state.

Subject A.W.

'We went off a bit into some, well one or two bushes - not enough to conceal what we were doing. I started feeling her up and she said she didn't want me to, but I carried on and I said 'Why do you say not to?' and she said 'Because I want you to' - which I thought made a sort of sense and I was thinking 'Well that's typical - you've got to get them going before they say 'yes'. She had small breasts.

yes, I took her trousers half down.... she had a suede cut and I called her 'stubble-head' ... I was going to ....even though there were people around... but then I thought 'No, you will waken up some part of your brain which will lead to... you'll wake up'. (Tape report)

Green quotes Fox on the suppression of emotion in lucid-dreams:

'It was so difficult to maintain the role of an impersonal observer in this strange Dream World, to realise that if I allowed my emotions to get the better of my mental control the dream would come to an abrupt end. I would enter a restaurant and order a meal, only to wake after savouring the first few mouthfuls. Indeed, to see how much one could eat, without paying attention to taste, would form a good exercise in mental control if only these Dreams of Knowledge were more easily come by; but, as things are, there are better ways of spending one's time in the dream, and I do not recommend it. Similarly, I would visit a theatre, but could never stay in the dream more than a few minutes after the curtain had risen, because my growing interest in the play broke down my mental control of the experience. I would encounter a fascinating lady and even talk to her for a while, but the mere thought of a possible embrace was fatal'. (Pages 43-44)

Green finds that two types of activity in the lucid-dream cause a loss of lucidity:

1. Activities which arouse an emotional conflict, as they are not performed when awake. For example, dangerous, immoral (to the subject) or antisocial behaviour.
2. Activities which lead to a loss of mental control, or an uncritical attitude to events. (e.g. the Fox case above).

Green states that a few Subjects reportedly experience a type of claustrophobia in that they feel trapped within the dream. This can cause fear - which probably wakes the Subject.

According to Green, one remarkable characteristic of Lucid-dreams is their relative controllability. However, many people who experience them are unaware of this aspect. People report that they can, to varying degrees on different occasions, influence the action and course of events in these dreams. Attempts at control seem to have to be indirect usually, for instance, in desiring to travel to a place it might be necessary to simulate some form of transportation. Occasionally, something causes the Subject to wake at this stage. As well as making things happen, another form of control is to keep calm throughout the dream - perhaps by ignoring surrounding events. This form of control is referred to by Whiteman (1961). Subject 'A.W.' in this study considers that this technique prolongs lucidity.

Controllability does not appear to be a learned skill. This author managed to make a girl appear by conscious thought during his first lucid-dream~ - although the way she entered the dream was not as planned:

'I remembered the controllability aspect of lucid-dreams and thought I would try to make a girl appear and that she should resemble someone I once knew. There was a stack of deck-chairs about 20 feet away. I walked up to them thinking that she would be behind them. As I approached the deck-chairs I remember thinking what a lot of dream-time this action would occupy. I looked round the pile of chairs but there was no girl. I felt disappointed at this inability to control dream content and walked on. Suddenly I noticed a young girl walking towards me. She was short with dark hair - which fitted the required description. I was wondering whether to speak to her when she smiled at me and said 'Hello'. I took her hand and we walked off happily together'. (page 367)

A detailed study of which dream activities can be controlled and to what extent might lead to interesting findings of consistencies between subjects, which could shed new light on the nature of dreams.

13. Extra-sensory-perception and lucid-dreams.

Green considers there is evidence for E.S.P. in 'waking-lucid-dreams' and hence expects a similar finding in sleeping-state lucid-dreams. Few writers appear to have made suitable experiments though. Green cites an example of apparent telepathic E.S.P. from 'Subject A':

> 'I became aware that I was dreaming and decided to try to communicate with my son. I had an impression that contact had been achieved and attempted to convey to him the words, 'I can't stay long; I am feeling muzzy.' When I met my son the next day for lunch he repeated these words to me before I had mentioned the matter to him and said that he had received the impression in a dream in which he also was aware that he was dreaming'. (Green 1968, page 110)

Van-Eeden reported a case of ostensible E.S.P. from a lucid-dream:

> 'In May, 1903, I dreamed that I was in a little provincial Dutch town and at once encountered my brother-in-law, who had died some time before. I was absolutely sure that it was he, and I knew that he was dead. He told me that a financial catastrophe was impending for me. Somebody was going to rob me of a sum of 10,000 guilders. I said that I understood him, though after waking up I was utterly puzzled by it and could make nothing of it... I wish to point out that this was the only prediction I ever received in a lucid-dream in such an impressive way. And it came only too true, with this difference, that the sum I lost was twenty times greater. At the time of the dream there seemed not to be the slightest probability of such a catastrophe. I was not even in possession of the money I lost afterwards. Yet it was just the time when the first events took place. The railway

strikes of 1903 - that led up to my financial ruin'. (Page 451)

The type of E.S.P. experiment advocated by Green appears to be 'traveling-clairvoyance' where the dreamer goes to a place and ascertains information which can be verified later. Straightforward simultaneous E.S.P. experimentation is, at this stage, an impossibility due to the low frequency of lucid-dreams and the fact that it is not feasible as yet to determine when a Subject is experiencing a lucid-dream. If that were so, a fellow 'receiver' or 'transmitter' of E.S.P. information could be roused to take part in an experiment.

The discrete altered state of consciousness which is the lucid-dream, may be accessible to extra-sensory information. Work at the Maimonides laboratory in New York has claimed some support to the concept of telepathy in ordinary dreams (Ullman & Krippner, 1969).

11. False-awakenings.

A false awakening occurs when a person is under the misapprehension that waking has occurred from a dream. The verisimilitude of the dreamer's bedroom may be so perfect that the Subject does not even question whether it is a dream. The state fairly frequently appears after a lucid-dream, although it is present too with ordinary dreams. Indeed a wakefulness-illusion may also occur at other times during the night.

Subject A.W. reported:

'I was aware of possible false awakenings and I thought ' I'm doing alright' - but then, apparently, I had one because I certainly woke up from one. Possibly the telephone rang because I dreamt that it rang and I was trying to answer it, and I was thinking 'Am I too sleepy to realise what is happening - they're not saying anything because they can tell I'm being stupid'.

because I kept saying 'Hello' and they didn't say anything. I thought I'd better record it and the tape-recorder went wrong. The cassette seemed to be half out and it was making a funny whining noise and I couldn't stop it. I started pulling the batteries out and it was shortly after that I woke up'. (Taped report)

Repeated false awakenings have also been recorded. Green cites Delage who several times one night dreamed he was urgently called to a sick person. Each time he dressed hurriedly, and sponged his face, The feel of water he thought 'woke' him on each occasion, but in the morning there was no evidence that he had left his bed.

Green holds the view that there are two types of false awakening:

1. When the Subject is thinking about or relating a previous dream experience. If the subject realises it is still a dream a further lucid-dream results.
2. A rarer category is where the Subject appears to wake, but in an atmosphere of suspense. The effect is supposed to increase in strength over time, or the Subject may wake to a 'stormy' atmosphere. Green states that not all lucid-dreamers experience it, and very few unsophisticated Subjects. Fox wrote:

'I passed from unremembered dreams and thought I was awake. It was still night, and my room very dark. Although it seemed to me that I was awake, I felt curiously disinclined to move. The atmosphere seemed changed, to be in a 'strained' condition. I had a sense of invisible, intangible powers at work, which caused this feeling as of aerial stress, I became expectant. Certainly something was about to happen'.

If the state persists apparitions may be observed, or psycho-kinetic phenomena. Fox (1962) found that recognition of this state led to an out-of-the body experience.

15. Lucid-dreams in 'hypnosis'.

Green claims that lucid-dreams occur spontaneously in light 'hypnosis' - without direct suggestion, This author seriously doubts that 'hypnotic' lucid-dreams and nocturnal dreams are the same phenomenon. There has been debate in the literature concerning alleged similarities between ordinary nocturnal dreams and 'hypnotic' dreams. Klein (1930), for example, held that there were no differences between the two phenomena since similar types of dream report occurred. Both phenomena were supposed to operate at an unconscious level evincing a manifest and latent dream content (Mazer, 1951).

Tart (1964), however, pointed out that experimenter bias and demand characteristics had invalidated many experiments on 'hypnotic' dreams. Also, electroencephalographical recording was not used. Some 'hypnotic' dreams may have been Stage 1 Sleep dreamlets. Tart concluded, after experimentation, that the two phenomena can be distinguished in several ways. Thus, physiologically, the EEG and basal skin resistance are quite distinct; no 'dream-work' mechanisms were observed in his study; some Subjects could not dream of the suggested topic at night, but could apparently do so in 'hypnosis'.

This author's own experience with research into 'hypnotic' dreams reinforces the view that the two phenomena are not identical. In a study (Hearne,- 1973) 'hypnotic' subjects produced dreams which were repeatedly stopped on command after brief running intervals. When stopped the Subject 'projected' the image onto a drawing board and traced the outlines of objects as well as describing colours, textures, etc. The end product was, ostensibly, a series of pictures from a 'hypnotic' dream.

However, it was later discovered, using several subjects, that the same results could be obtained without prior ‘hypnosis’. The important factor was imaging ability (see page 11.1), not ‘hypnosis’. It is interesting to consider that a Control group of simulators might not have produced the same results - due to their poorer imaging ability (Sutcliffe, Perry & Sheehan, 1970). Hence, yet again, a phenomenon peculiar to ‘hypnosis’ might have been claimed. In another study (Wagstaff, Hearne & Jackson, 1978) the finding that the amount of REM sleep was decreased by a ‘post-hypnotic’ suggestion to dream on any topic (Stoyva,1965a) was duplicated without ’hypnosis’ - using mere instructions to Subjects. Green’s ‘hypnotic’ lucid-dreams are surely examples of spontaneous imagery. Demand-characteristics (Orne, 1962) could also be influential in the experimental situation.

16. False lucidity.

Green does not mention a reported 'false lucidity' phenomenon, although van Eeden comments on this. However, he blamed such episodes on 'demoniacal mockery'. Van Eeden wrote:

'In March 1912, I had a very complicated dream, in which I dreamt that Theodore Roosevelt was dead, then that I woke up and told the dream, saying: 'I was not sure in my dream whether he was really dead or still alive; now I know that he is really dead; but I was so struck by the news that I lost my memory'. And then came a false lucidity in which I said: 'Now I know that I dream and where I am.' But this was all wrong; I had no idea of my real condition, and only slowly, after waking up, I realised that it was all nonsense. (Page 454)

False lucidity may perhaps be explained more satisfactorily by the intrusion into an ordinary dream of a virtually automatic thought that the situation is a dream, but that in this rare case the comprehension behind the thought is lacking. It is presumably more common in habitual lucid-dreamers.

V.4 WRITERS ON LUCID-DREAMS:

A handful of writers have recorded accounts of their lucid-dreams, collected over several years: Hervey de Saint-Denys (1867,1964), van Eeden (1913), Delage (1919), Fox*(1962), Ouspensky (1960), Whiteman (1961).

The Marquis Hervey de Saint-Denys kept a diary of his dreams from the age of 13, and noted his observations (with coloured drawings) over some 1,900 nights. He experienced consciousness in dreams and was able to exercise control although it was never really absolute. He performed experiments in dreams, an example of which is the following:

'One night, while sleeping, when I felt complete knowledge of my real state and I was rather apathetically watching the passage of the whole phantasmagoria of my sleep which, incidentally, was very clear, the idea occurred to me to take advantage of it, to make some experiments with the power I might or might not have of evoking certain images by the use of my will alone. I tried to evoke (some monstrous apparitions seen in a previous dream). This first attempt met with no success. At this moment the pastoral scene of a countryside gilded by bright sunshine unfolded before me... I imagined that if, in a dream, I performed the action of putting my hand in front of my eyes, I should obtain a first illusion in relation to what would actually happen if I did the same thing while awake; that is to say that I would make the images of objects which seemed to be situated in front of me disappear. Then I asked myself whether, once this interruption of pre-existing visions had taken place, my imagination would not find it easier to evoke the new objects on which I was trying to fix my thoughts. The experiment followed this reasoning closely. In my dream I saw a hand in front of my eyes, and this did indeed have as its first effect the destruction of the vision of the countryside...

(* Pseudonym of Hugh G. Galloway).

For a moment I remained without seeing anything, as would have happened in real life. Then I made another energetic call to the memory of the famous eruption of monsters and, as if by enchantment, this memory, now clearly placed in the objective of my thoughts, suddenly stood out sharp, brilliant and tumultuous, without my even noticing, before waking, the way in which the transition had taken place'. (Pages 283-286)

Hervey de Saint-Denys was certainly an important pioneer in the discovery to science of lucid-dreams.

The term 'lucid-dream' was apparently first employed by van Eeden. Other writers have used different descriptive terms. In a paper read to the Society for Psychical Research that author gave examples of several lucid-dreams out of over 350 he had experienced since 1896. He insisted that they were genuine dreams occurring invariably between 5 and 8 a.m. They were generally pleasant and contained flying or floating frequently. He reported having nearly complete recollection of day-life in the dream and a clear recollection on waking. They were stated to have a very beneficial effect and were allegedly occasionally premonitory.

He quotes the German poet Novalis as saying that when we dream we are dreaming, we are near waking up, but he decidedly rejects that view. Van Eeden stated firmly that lucid-dreams occur in deep sleep. His approach was sensible, scientific and based on the vast experience of many hundreds of dreams. His testimony appears highly credible and the scientific testing of conditions within lucid-dreams was an important contribution to understanding the phenomenon.

Delage experienced only a few lucid-dreams. A characteristic of his was to perform dangerous activities in these dreams in order to observe the consequences.

Delage (1919):

'After various happenings, I find myself at the edge of a frightful precipice, the mere sight of which makes me tremble: a sheer, or even, overhanging, cliff many hundred feet high. At the bottom are sometimes sharp rocks, sometimes houses and trees which look small in the distance. At the moment when I tremble and hold tight, the dream suddenly becomes conscious: I realise that I am dreaming, that all this is illusory and that I am in no real danger. Then, in order to see what will be the result of this decision, I make up my mind to throw myself into the abyss. I do so and I always arrive at the bottom without a shock unless my fall ends in a delightful flight.' * (Page 453)

He stated that his 'conscious' dreams were not like ordinary day-dreams in that in the latter type he had full control over the actions. He continued:

'..in conscious dreams, the awareness of the fact that I am dreaming, is the only point of contact with reality. Everything else belongs to the dream which, although more or less directed by my will in certain respects, still contains a very considerable degree of scope for the operation of the unforeseen, independently of my will and controlled by factors outside my consciousness. Everything appears vividly objective and as convincing as the events of real life, in a way which is quite different from the feeble impressions of day-dreams'. (Page 454)

Fox (1962) used the term 'dreams of knowledge' or 'celestial dreams to describe lucid-dreams – which he thought occurred when the 'critical faculty' had become aroused. He referred to degrees of realisation and propounded a direct proportional link between the dream's vividness and level of realisation.

'To get the best results I had to know all about the past life of my earthly self, just as one does in waking life, to realize my body was asleep in bed, and to appreciate the extended powers at my command in this seemingly disembodied state.' (Pages 34-35)

(* Translated by C. Green, 1968).

He maintained that the deliberate prolongation of a lucid-dream led to a different phenomenon termed ‘Astral projection’ or ‘Out-of-the-body’ state. Another method of achieving ‘astral projection’ described by him was to ‘sit-up’ out of a Type 2 false awakening (V.3.14). An important consideration requires to be mentioned here though. Perhaps the definition (to the Subject at the time) of the experienced state depends on the dream environment. If a Subject becomes lucid when say walking along a road, the natural assumption may be to classify it as a dream. However, if the lucidity occurs in a dream-environment, identical to the Subject’s bedroom, especially in a false awakening, an ‘out-of-the-body’ definition may be applied. Fox’s reference to catalepsy after ‘out-of-the-body’ experiences points to the phenomenon occurring in sleep.

Ouspensky (1960) made deliberate attempts to produce consciousness in dreams. He maintained that such observations did not alter the essential dream and so was free from what today would be termed ‘Experimenter bias’ (Rosenthal, 1963). His ‘lucid-dreams’ - if that is what they were - were entered in a ‘half—dream’ state. His method was to try to continue awareness as he fell asleep. He reported an ability to control these half-dream state phenomena. This author considers it more probable that the experiences were a form of controllable hypnagogic imagery.

Whiteman (1961), a mystic, has experienced and categorized some extraordinary altered states of consciousness. To him, the term ‘lucid-dream’ should be applied only to types denominated a dream at the time, but with minimal insight. Dream experiences where experiments are conducted should then be termed fantasy-separations or full-separations (of consciousness from the body) according to the degree of control and insight.

insight. This seems unnecessarily complicated though and the boundaries could not be fixed. His claim that states of separation can be entered when awake needs to be studied by electro-physiological monitoring, as it could be that the assumption of wakefulness is illusory. In addition one would wish to know the extent of the Subject's own waking imagery ability. Whiteman's categories may be entirely personal to him, and the strong religious bias does not aid a scientific, rational, evaluation.

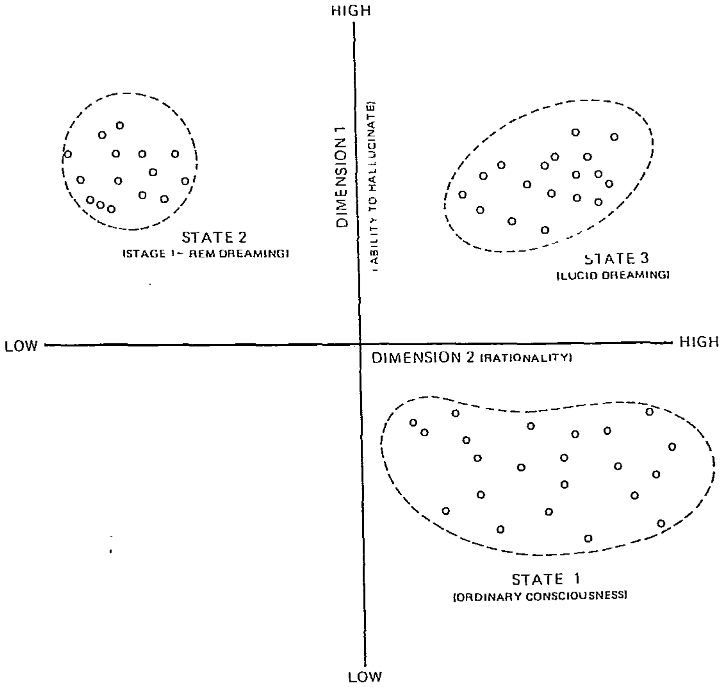
Faraday (1972) reports that she has experienced a 'lucid high dream' which developed from an ordinary lucid-dream. In the 'high' state she felt great exhilaration as if under the influence of psychedelic drugs:

'..the most extraordinary feeling came over me. Surges of energy pulsated throughout my body and I entered a 'high' in which I was completely transported on the kind of internal journey only those who have experienced psychedelic drugs would understand. I could actually feel my body being moved by this energy although I knew perfectly well that I was asleep. In the distance, I could hear the hammering of the builders in the basement, a dog barking in a neighbour's garden, and the distant sound of traffic. I was filled with an enormous compassion for the whole of mankind for not being able to share my strange and wonderful experience at that moment...'. (Pages 294-295)

Tart (1969) had found that a class of 'high' ordinary dream can occur in persons who had experienced psychedelic drugs. Faraday however states that she had such a dream before her experiments with drugs. Afterwards, she was able to enter a 'high' condition in a dream by merely wishing she had some LSD. The 'flashback' could be neuro-chemically caused or, perhaps more likely, the mind-images of a previously experienced pleasurable state.

Tart (1975) in attempting to work towards some conceptualisation of states of consciousness plotted the 2 dimensions of Rationality and Ability to hallucinate, to produce quadrants consisting of State 1 , ordinary consciousness; State 2, REM dreaming; State 3, lucid-dreaming. (Diagram below). The approach is simplistic though, and could give rise to basic misconceptions about the state of lucid-dreams. In any case, rationality is often good in ordinary dreams and may be poor in lucid-dreams. A better dimension would be 'awareness', but can there really be such a scale?

Discrete States of Consciousness


HIGH
DIMENSION 1
(ABILITY TO HALLUCINATE)
STATE 2
(STAGE 1- REM DREAMING)
STATE 3
(LUCID DREAMING)
LOW
DIMENSION 2 (RATIONALITY)
HIGH
STATE 1
(ORDINARY CONSCIOUSNESS)
LOW

Mapping experiential space at various times.

From Tart (1975)

V.5 LUCID-DREAMS IN RELATION TO DREAM THEORIES.

If lucid-dreams are in fact true dreams occurring in Stage REM sleep, as distinct from waking-imagery fantasies, they constitute a difficulty for some dream theories.

Freud in fact accepted (in additions to his work 'The Interpretation of Dreams' 1909, 1914, 1930) that some persons can consciously control their dreams. A wish to enjoy the dream might even underlie this ability. Consciousness enters dreams on other occasions when control is lost. In some nightmares the thought occurs 'It is only a dream' as a defence against the realisation of basic unsavoury truths.

Jungian theory, and later similar ideas, might interpret the lucid-dream as an indication that the dreamer has developed some insight into an aspect of the Self , although this approach could entirely miss the point that the lucid-dream is a phenomenon in its own right.

Evans and Newmans' computer theory of dreams cannot explain any volitional control of dreams. They are supposed to be the passively observed result of updating processes in the brain. Similarly, Jouvet's view that PGO spikes cause cortical stimulation so producing dreams cannot cope with an autonomous dream. Likewise, Hartmann's circuit-testing and shunting-out theory would appear to require revision.

V.6 EXPERIMENTAL CONSIDERATIONS:

Green’s examples of lucid-dreams, since they cover apparent waking phenomena, point to spontaneous imagery rather than REM-state dreams. Surely she is defining the term too broadly. Those alleged lucid-dreams occurring via ‘daylight impressions’ and ‘hypnosis’ , recorded by her, are not in states of sleep and the term lucid-dream should therefore not be applied to them. What is required is an electrophysiological sleep study using lucid-dream Subjects to ascertain in which sleep stage these phenomena occur. The enormous problem here though is, if they do occur in sleep, how can the Subject indicate when such a dream is experienced? A person might wake and pronounce having just had a lucid-dream, but that does not constitute scientific proof that the event was really recent. The subject may have confused REM periods for instance, and not in fact woken in the lucid-dream REMP. Imagery characteristics should also be surveyed since if the phenomenon is a product of visual imagery, scores on that dimension should correlate with the frequency of lucid-dreams.

Green considered the experimental prospects concerning lucid-dreams. She stated that on the reported evidence it would be expected that:

1. Lucid-dreams should occur in the latter part of the night.
2. Presumably they should be associated with REM sleep.

She stresses the importance of determining how the EEG of lucid-dreams relates to ordinary dreams.

Tart (1965) wondered whether a 2-way communication system between Subject and Experimenter could be developed so that instructions and reports could be signaled.

He pointed out that such a step would change the status of the dream from a subjective event reported retrospectively, to a more immediate sort of behaviour. Tart asked whether subjects could incorporate certain stimuli so that these could act as signals to direct the Subject to perform specific activities in the dream. He believed that simple motor acts, such as raising a finger, could be performed and he considered the possibility of Subjects using automatic writing or sleep-talking. Green also suggested that Subjects might be trained to make motor responses. The enormous hurdle though is the phenomenon of muscular atonia in sleep (page 25). Even if it were possible to make some form of muscular response on the realisation of lucidity, say be a conditioned twitch, that is not the same as signaling meaningful information spontaneously.

Green asks whether a subject in a lucid-dream is more accessible to external stimulation than in ordinary dreams - presumably as this might decide the 'depth' of sleep. A method of continual training of subjects to have lucid-dreams when falling asleep is recommended by her – however as she states elsewhere, that is not the typical lucid-dream. Van Eeden for instance who recorded over 300 lucid-dreams, found they occurred 'always' between 5 and 8 a.m. Green is obviously aware of the problem of identification of the point of lucidity in a nocturnal dream, hence her advocacy of the falling asleep type of alleged lucid-dream where the start is certainly known.

A further topic mentioned by Green is the possibility of subjects attempting ESP experimentation within the altered state of consciousness of the lucid-dream. Certainly, the fact that the subject knows what the situation is, enables such a study to be performed.

Clearly though, the overwhelming problem is that of signaling by the Subject. Is such a- technique feasible? Chapter VII gives an answer to that question.

A NOTE ON DEMAND CHARACTERISTICS.

In a paper, important concerning any research with human Subjects, Orne (1962) pointed out that the Subject's eagerness to please the experimenter can cause bias in the results. Thus 'demand characteristics' can operate in the experimental setting. The subject cannot be regarded as a 'passive responder' to stimuli. He or she has motivations concerning the experiment and an idea of what the outcome should be. Consciously or un-consciously the Subject may actively perform in a way to validate the experimental hypothesis. The psychological experiment is then a form of social interaction.

In 'hypnosis' work, for instance, simulating control Subjects (who simply pretended to be 'hypnotised') have been found to behave with great effectiveness, deceiving well trained 'hypnotists' (Barber, 1969).

In sleep and dream research both experimenter and Subject invest much time and often there is great inconvenience, hence it is to be expected that demand characteristics might affect the experimental results. This factor would have to be considered in planning the experiments.

In any discussion on dreams it is necessary to consider the philosophical aspects of the phenomenon this will be attempted in the next Chapter.

CHAPTER VI

PHILOSOPHICAL ASPECTS OF DREAMS

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CHAPTER VI

VI.1 PHILOSOPHICAL ASPECTS OF DREAMS

Dreams and sleep-mentation have been discussed by several philosophers. Malcolm (1959) examined the previously stated opinions of philosophical writers on dreams and claimed they were mistaken. Essentially Malcolm challenges the idea that dreams represent mental activity in sleep and that they may be consciously experienced. The matter is raised here not only for its relevance to dream study generally but because a scientific study of lucid-dreams might resolve the philosophical issues.

Descartes (193k) considered that a human mind is constantly conscious, even in sleep – consciousness being the 'essence' of mental substance. On dreams he says: 'All the same thoughts and conceptions which we have while awake may also come to us in sleep'. Malcolm quotes several other writers on this point:

Kant: 'In deepest sleep perhaps the greatest perfection of the mind might be exercised in rational thought. For we have no reason for asserting the opposite except that we do not remember the idea when awake. This reason however proves nothing'.

Moore: 'We cease to perform (mental acts) only while we are asleep, without dreaming; and even in sleep, so long as we dream, we are performing acts of consciousness'.

Russell: 'What, in dreams, we see and hear, we do in fact see and hear, though, owing to the unusual context, what we see and hear gives rise to false beliefs. Similarly, what we remember in dreams we do really remember; that is to say, the experience called 'remembering' does occur'.

Freud: 'Obviously, the dream is the life of the mind during sleep.'

Malcolm approaches the problem systematically. He point out first that it is absurd and self-contradictory for a person to assert or to judge that he or she is asleep, unconscious or dead. A person might say that he or she is asleep when actually asleep, but the remark would not be taken seriously since awareness would be absent. Malcolm says:

'In order to know that when a man said 'I am asleep' he gave a true description of his own state, one would have to know that he said it while asleep and that he was aware of saying it. This is an impossible thing to know because whatever showed that he was aware of saying that sentence would also show that he was not asleep. The knowledge required is impossible because it is self-contradictory.'

He further states that 'having some conscious experience or other, no matter what, is not what is meant by being asleep.'

Malcolm also considers states resembling sleep and concludes that hypnosis, for instance, is not sleep. Also, neither is a nightmare where a person is threshing about and talking. In the case of differential discrimination of external sounds (e.g. a baby's cry may wake a person whereas continual road traffic noise does not) the lack of perception of some stimuli satisfies the criteria for sleep.

Analysing further the question of judgements in sleep he considers possible ways of determining whether a person made a judgment in sleep:

1. The person might state an awareness of being asleep at the time of the judgment - but this is self-contradictory Malcolm asserts.
2. The person infers being asleep because:

a. The judgment was cotemporaneous with, say, a burst of thunder – but in that case the sleeper was not fully asleep says Malcolm.

b. The person knows the judgment was not made before or after sleep so it must be during sleep – but the conclusion does not follow and the truth is theoretically unverifiable.

c. At the time the person was having a certain experience that only occurs in sleep - but it cannot be verified that this experience ever does occur in sleep.

d. The person made the judgement whilst dreaming - but the assertion cannot be made that the judgment was made at the same physical time of dreaming - there are no grounds. Additionally, there are questions as to how the person knows dreaming occurred during sleep and how the person knows a dream was experienced.

3. No physiological phenomena can be used as evidence that a judgement was made in sleep. For instance, if, on making a judgment a particular brain-wave occurs its presence during sleep is not proof that a judgment was made since the correlation was established in persons who were awake.: it might be true or false.

The arguments propounded by Malcolm also apply to other mental phenomena, he states, such as thinking, reasoning, perceiving, imagining and questioning , as well as 'passivities' such as fear, anxiety, joy, and imagery. Dreaming though is an exception he says. The schema of proof against judgments in sleep does not apply. Claims Of making judgments or having imagery in dreams he says are meaningless because they cannot be verified whereas what establishes that a person dreamt is the telling of a dream. Malcolm at one time held that since it is theoretically impossible to verify that someone had images, say, in his sleep, but possible to verify that he dreamt, then a dream cannot be identical with, nor composed of, images experienced during sleep. He thought it proof that dreaming is not a mental activity or a mental phenomenon or conscious experience. However, he now considers these terms vague, so instead, he opines that dreams are not composed of thoughts, feelings and so on.

Malcolm states that he does not maintain that a dream is the waking impression that one dreamt. He does not know what dreaming is but we determine whether a person had a dream by receiving a dream report.

Commenting on the link between REM sleep and the great number of dream reports obtained on waking from that Stage compared to others, he points out that eye-movements should not be used as a criterion for having dreamt. The assumption for instance that a person who showed a long REM period but could only report a short dream, had forgotten part of the dream does not follow. Malcolm believes that the error of psychologists and others is to assume that a dream must have a definite location and duration in physical time - an example of what Wittgenstein termed a 'prejudice' caused by 'grammatical illusions'. The dreamer's assertion that he dreamt 'just before waking' is unverifiable. Similarly, the connection between events in the dream report and external stimuli does not mean the two events were simultaneous. The link is between waking reports of dreams and physical occurrences. The 'length' of a dream, too, has no clear sense.

What Malcolm says about sleep applies for most of the time and his comments on the dreaming/REM correlation are clearly sensible. However, his approach generally seems to be too simplistic. How could he explain for instance the case of a person in a state of 'sleep paralysis' where the person struggles (without actually moving) whilst being perfectly conscious of the situation? Physiologically the person is still in REM sleep, yet consciousness - is present (Rechtschaffen et al., 1963). In particular, the matter of lucid-dreams could demolish his stand if the dreamer could convey information from the lucid-dream to the external world and respond.

intelligently to questions from the real world. This would show the presence of thought in sleep and if the dream report on waking faithfully reflected information signaled from REM sleep, it would surely be the simplest and most intelligent step to regard the experience during which the signaling occurred as a dream if that is what it was later described as. Clearly, the study of lucid-dreams could exert a profound influence on great philosophical questions.

It has been the purpose of this Introduction to establish the particular area to be studied - the lucid-dream - and to illustrate how the phenomenon relates to the general backcloth of dreams and sleep-research. A thorough search of the literature indicated that no previous electrophysiological studies specifically on lucid-dreams had been published, therefore much useful information might be potentially discovered if an adequate methodology could he developed. The next section of this Thesis describes the whole course of experimentation.

PART 2

THE EXPERIMENTS

CHAPTER VII. THE NEW TECHNIQUE.

CHAPTER VIII. THE 1st A.W. STUDY - ELECTRO-PHYSIOLOGICAL FINDINGS.

CHAPTER IX. The 1st A.W. STUDY - PSYCHOLOGICAL FINDINGS.

CHAPTER X. OTHER LUCID-DREAM SUBJECTS.

CHAPTER XI. SIMULATING CONTROL EXPERIMENT.

CHAPTER XII. LUCID-DREAM INDUCTION EXPERIMENT.

CHAPTER XIII. The 2nd A,W. STUDY.

CHAPTER XIV. ADDITIONAL DATA FROM SUBJECT A.W.

CHAPTER XV. QUESTIONNAIRE INFORMATION.

CHAPTER XVI. PERSONALITY AND INTELLECTUAL CAPACITY IN RELATION TO LUCID-DREAMS.

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OVERVIEW.

The next 10 Chapters describe the experimentation performed for this Study. At the beginning of the research there was no apparent previous experimental work in the area on which to base experiments. The main problem was that of marking the lucid-dream in the polygraphic record. Chapter VII describes the successful technique (involving ocular signaling) which was fortuitously hit upon.

Having developed a method which effectively 'event-marked' the lucid-dream, and could also be used as a channel of communication from the lucid-dreamer, the next Chapter (VIII) describes a large-scale study which obtained and analysed electro-physiological data from 8 lucid-dream-night records (and 8 Control nights) monitored from one subject.

The next Chapter (IX) presents an analysis of the psychological results of that first study.

Having acquired much information concerning lucid-dreams in this Subject, Chapter X reports on attempts to find other suitable subjects and the great problems encountered. One other subject was obtained in that study.

In order to consolidate the evidence for ocular signaling from Stage REM sleep, and being aware of the strength of demand-characteristics in Experimental situations, the author next performed an experiment involving Control subjects attempting to simulate these signals (Chapter XI).

The relative scarcity of lucid-dreams in the sleep-laboratory led to an experiment to try to artificially induce lucid-dreams in Subjects by an external-stimulation method (Chapter XII).

A further study was next performed on the original Subject (Chapter XIII) to obtain information of a more diverse nature. In addition, analyses were conducted on extensive questionnaire and diary-data supplied by that Subject (Chapter XIV).

Results of a questionnaire survey concerning lucid-dreams in a large number of persons are reported in Chapter XV, and Chapter XVI describes attempts to determine whether personality and intelligence factors relate to the experience of lucid-dreams.

CHAPTER VII

THE NEW TECHNIQUE

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CHAPTER VII

THE NEW TECHNIQUE.

VII.1 INTRODUCTION.

From the evidence discussed in III.8 this author did not believe that volitional motor movements (e.g. pressing a micro-switch) could occur in Stage REM sleep, in which it was assumed lucid-dreams would be found. Nevertheless, a micro-switch technique of signaling would be tried. However, in considering an alternative method it seemed a distinct possibility that eye-movements might provide the answer. The eyes are, of course, readily motile in REM sleep, whilst the rest of the body experiences a lack of muscular tonus (III.1). The question of whether REMs represent looking-at-the-picture ocular activity (Aserinsky & Kleitman, 1955; Dement & Kleitman, 1957a) or are simply concomitants of a change of neurophysiological conditions (Oswald, 1962), has been a moot one in sleep-research. On the one hand, experiments such as that of Dement & Wolpert (1958a) in which last-recalled Eye-movements before waking were compared with the EOG record, offer evidence for the 'scanning' hypothesis. On the other hand the fact that congenitally blind persons show REMs (Gross et al., 1965) does not support the idea. Perhaps both views are correct. Conceivably, most REMs are spontaneous and undirected (too gross to be scanning, as Oswald, 1962, commented), but that some are deliberate scanning movements.

So, in the belief that directed ocular movements are possible in dreams, a sleep-lab study was begun to test the efficacy of ocular signaling from lucid-dreams, as well as the feasibility of motor responses.

It was anticipated that if the subject made a sequence of 8 regular ocular movements on attaining lucidity, this would produce a distinctive EOG pattern (different from the usual random trace) which could be easily identified in the polygraphic record.

This preliminary study was to continue until the S reported having had a lucid-dream in which he made ocular signals. The S would also be required to press a micro-switch, to test for any slight muscular response. If this were possible it would provide a simpler method than ocular signaling, as the micro-switch could be linked directly to the timer/marker pen on the recording apparatus.

VII.2 METHOD.

A 37 year old male who reported that he experienced lucid-dreams approximately once or twice a week expressed interest in being an experimental subject. He stated that he had had these dreams for some 20 years and reports an ability to control the content and course of action to some extent. He was unpaid.

(b) Apparatus:

This initial study was conducted in the sleep-laboratory using an Elema-Schőnander Mingograf recording apparatus. Four channels recorded bipolar EEG, EOG (2 pens) and submental EMG. Control settings were:

EEG: Gain: 70μV/cm., time-constant: 0.3 secs., filter: 15 Hz.
EOG: Gain: 70μV/cm., time-constant: 0.3 secs., filter: 15 Hz.
EMG: Gain: 20μV/cm., time-constant: 0.015 secs., filter: 700 Hz.

The micro-switch (Burgess Products Co. Ltd) required a pressure of 200 gm to operate. It was taped into the palm of the hand so that the fore-finger could press the button.

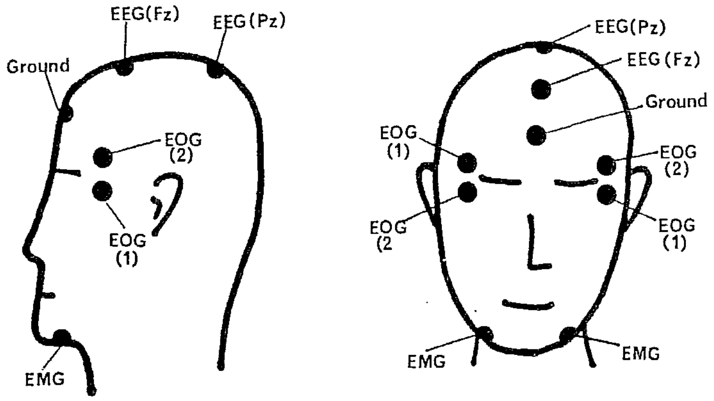

FIGURE VII.1
ELECTRODE POSITIONS

(c) Electrode emplacements:

1cm diameter dome-shaped silver/silver-chloride electrodes were attached to the scalp by collodion glue and to facial skin by micropore surgical tape. Electrode-gel was introduced under the dome by syringe, to improve conductance.

EEG was derived from electrodes positioned at approximately Pz and Fz points, according to the International 10-20 electrode system (Jasper 1958). EOG was recorded from electrodes placed above and below the outer canthus of each eye, measuring diagonally across the face, so picking-up potentials caused by shifts of the dipole moment of the electric charge between the retina and front of the eye. The EMG electrodes were situated on the jaw-bone, on either side of the chin, monitoring muscular tonus. A ground electrode was placed on the subject's central forehead.

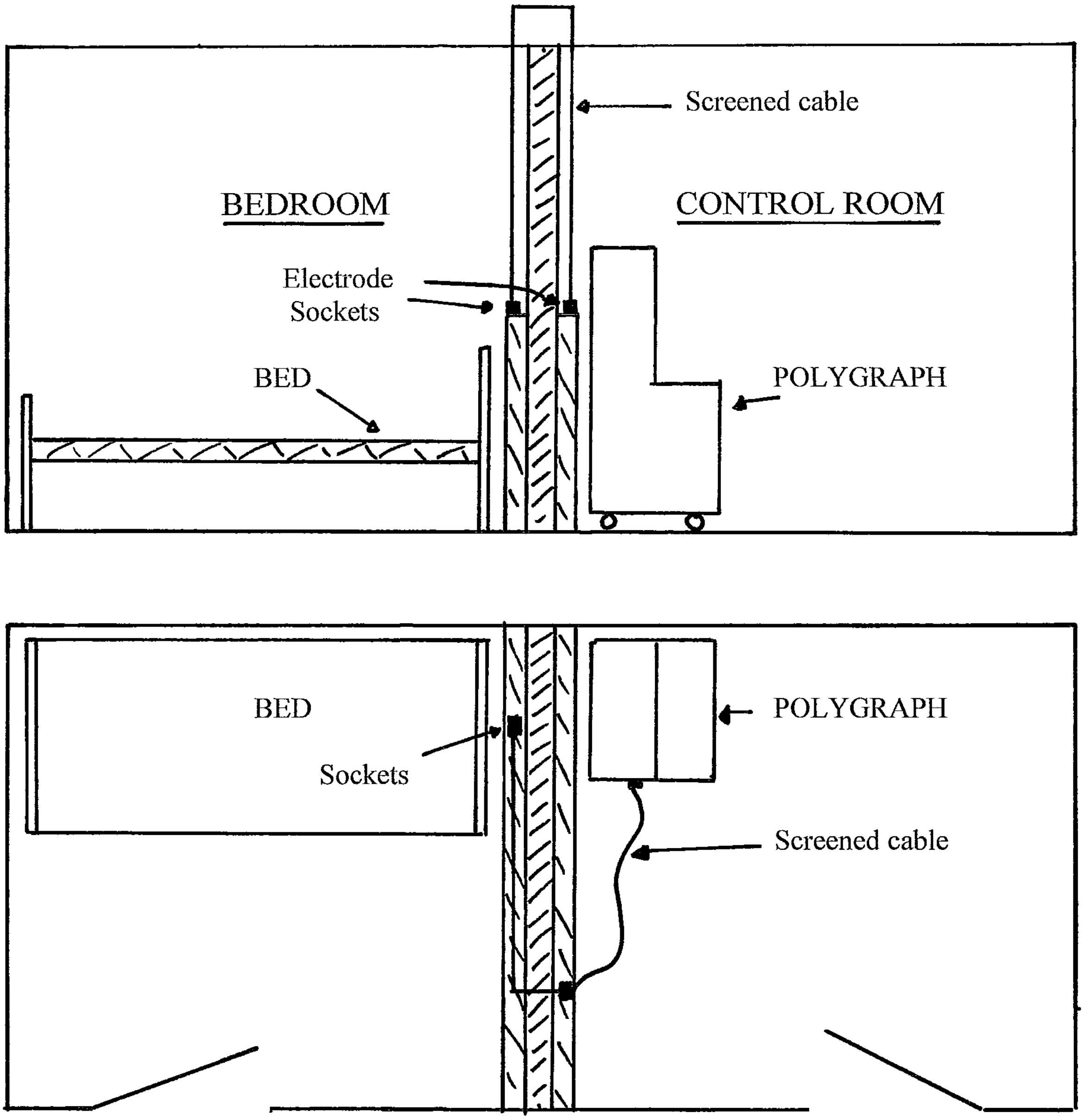
Screened cable
BEDROOM
CONTROL ROOM
Electrode
Sockets
BED
POLYGRAPH
BED
Sockets
POLYGRAPH
Screened cable

FIGURE VII.2

LAY-OUT OF SLEEP-LABORATORY

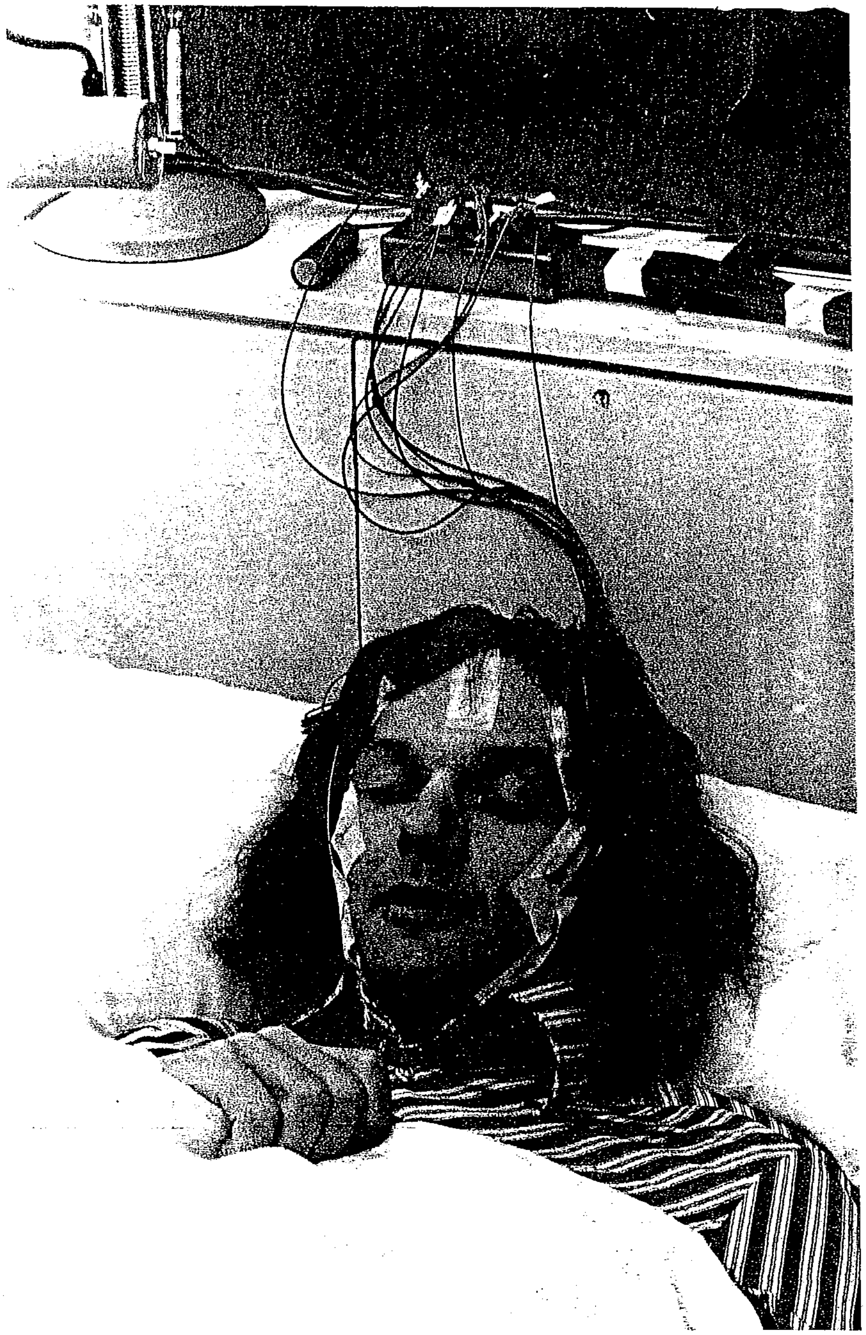

FIGURE VII.3 SUBJECT WIRED-UP FOR LUCID-DREAM EXPERIMENT

(d) Instructions to S: (Delivered verbally by E).

'At any time tonight whenever you become aware that you are dreaming, move your eyes from left to right 8 times. At the same time press the micro-switch. Practice it now a few times. When you wake yourself [1] from the lucid-dream, call out stating that you've had a lucid-dream, - turn on the tape-recorder and give a full report of what happened in the dream'.

The S was at no time informed that muscular atonia is present in REM sleep in case demand-characteristics (Orne,1962) were introduced into the experiment. Subsequent questioning revealed that the S appeared to be unaware of the phenomenon. Spontaneous reporting of lucid-dreams was necessary in case of cueing by the E.

(e) Experimental procedure.

The S was wired-up and went to bed.

In this initial study, the E did not manipulate conditions. On the relevant 2nd night (see VII.3) the S went to bed soon after midnight, feeling normally fatigued after an ordinary though busy day. He had high expectations of producing a lucid-dream and signaling by both methods. Sleep onset time was not recorded due to malfunction of the Mingograf initially (see sleep-pattern, page 178).

([1] The S usually roused himself after a lucid-dream)

RESULTS:

The data suggests that ocular movements are a suitably effective method of signaling from the lucid-dream. On the first night of the study, the S woke at 8a.m. and reported having signaled from a lucid-dream. Unfortunately, the recording equipment had been switched off shortly before. On the second night, the S again reported a lucid-dream. He was able to make extreme horizontal eye-movements without waking*. The lucidity-onset signals are shown on page 163, whilst the whole lucid-dream is displayed on page 171.

(a) Evidence for the Stage of sleep when signaling.

The Stage of sleep at signaling is unambiguous REM (Rechtschaffen & Kales, 1968), having:

1/ Low-voltage EEG with 'saw-toothed waves' characteristic of Stage REM sleep (Schwartz & Fischgold, 1960), and absence of alpha rhythm. (The S produces much 8-10 Hz activity when awake - see Appendix, page 369).

2/ Random rapid-eye-movements, followed by the sequence of deliberate ocular signals.

3/ Low-voltage EMG, with heart-pulse from nearby blood-vessels showing through.

4/ No movement artefacts present.

(b) Absence of a muscular response in the hand.

The S reported dreaming of pressing the micro-switch, and even hearing it 'click', but in reality he did not. The switch was not malfunctioning, as it operated on test, and when the S accidentally pressed it in sleep during movement.

(* The criteria of wakefulness and sleep correspond to those of Rechtschaffen & Kales, 1968)

(c) Independent assessment of the results.

Results of this study (and several subsequent examples) were conveyed to Professor Allan Rechtschaffen at the University of Chicago, who expressed himself convinced that the signals were from Stage REM sleep.
He stated that he too had used an eye-movement method for obtaining simple information from a patient in a state of narcolepsy (Private communication, 1975. See Appendix, pages 370-371).

VII.4 CONCLUSIONS.

This test demonstrated that a technique of signaling from lucid-dreams using eye-signals was feasible whereas motor-movements were apparently not. The lucid-dream was seen to emerge in Stage REM sleep as anticipated. The Electro-physiological and psychological information regarding this first identified lucid-dream is stated in the next Chapter as part of the accumulated results obtained from 8 lucid-dreams.

CHAPTER VIII

THE 1ST A.W. STUDY - ELECTROPHYSIOLOGICAL FINDINGS

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CHAPTER VIII

THE 1ST A.W. STUDY - ELECTROPHYSIOLOGICAL FINDINGS

VIII.1 INTRODUCTION

It was decided to follow up the successful demonstration of ocular signaling from lucid-dreams by a major study. The aim would be to obtain a record of lucid-dreams having signals, so as to provide a satisfactory statistical comparison on several measures, with selected Control nights (when the S had no lucid-dreams.) Simple manipulations of experimental conditions would be performed, and the S would be required to perform certain pre-determined tasks in the lucid-dream, on occasions (These aspects are covered in Chapter IX).

Nothing was known about basic sleep parameters of lucid-dreams. Major questions selected for examination were:

1/ Do lucid-dreams always occur in REM sleep, or are some a form of hypnagogic / hypnopompic / imagery happening outside of REM?

2/ What is the duration of lucid-dreams? (This S had estimated a few minutes.)

3/ At what time of night do they occur?

4/ Is the sleep-pattern of lucid-dream nights any different from non-lucid-dream nights?

5/ If lucid-dreams do occur in Stage REM, how far into the particular REMP do they occur?

6/ Is the lucid-dream REMP disturbed in any way, indicating a lighter sleep?

7/ Are lucid-dreams different autonomically, from ordinary dreams, as reflected in heart-rate and REM amount (linked with dream activity, Dement & Wolpert, 1958b)?

It was hoped that, for the first time, answers to these questions would be objectively ascertained using the S's ocular signals as chart-markers to indicate the onset of lucidity.

It should be mentioned that this S usually roused himself after a lucid-dream. That fact alone might have identified the immediately preceding sleep-stage and time of lucid-dreams, but not reliably so, as the S could confuse dream periods if he had not actually woke after lucidity. In any case, signaling from within the dream could obviously provide much more potent information.

½½

VIII.2 METHOD:

(a) Subject: The same person was willing to return to the sleep-lab from time to time for further monitoring during sleep. It was decided to take advantage of this generous offer and obtain as much data as possible from the subject before attempting to generalise any findings.

(b) Apparatus.

The same Elema-Schőnander Mingograf (see page 159) was employed at first in this study, but later a Grass polygraph (Type 7B) was used as the recording instrument.

Polygraph settings were:

EEG: Gain: 75μV/cm., time-constant: .45 secs.,
½ amplitude high-frequency setting: 35Hz.
EOG: Gain: 100μV/cm., time-constant: .45 secs.,
(2 pens) ½ amplitude high-frequency setting: 35Hz.
EMG: Gain: 20-50μV/cm., time-constant: .015 secs.,
½ amplitude high-frequency setting: 3KHz.

(c) Experimental design:

Details of manipulations and Subject's tasks are stated in the next Chapter, as only the basic parameters of lucid-dreams are dealt with here.

(d) Instructions to subject:

Instructions to the subject were essentially the same as before (VII.2.d), with modifications for various subject tasks. The tasks are described in Chapter IX.

(e) Measures and statistics involved:

Eighteen measures were employed in the statistical analyses. These are shown in Table VIII.1, page 162.

The following measures were quantified thus:

REM amount: This was scored by having a naive assistant rate the amount of REM activity per page of sleep record according to 5 categories: No REMs, ¼ page of REMs, ½ page of REMs, ¾ page of REMs, continuous REMs. The result was divided by the number of pages to give a mean REM score.

Heart-rate: This was observed from the EMG trace. The pulse, from blood-vessels near the recording chin electrodes, became pronounced enough for visual counting in the low-tonus EMG during Stage REM sleep. Heart-rate was measured by a naive assistant for 1-minute periods.

Sleep-disturbances: Any observable increase in EMG was counted as a sleep disturbance. The naive assistant determined where this occurred.

Sleep-onset: This was taken to be from the first k-complex in the sleep-record. The E observed this measure.

% Stage: The percentage of each Stage of sleep was measured, up to and including the lucid-dream, but not after, in case waking and reporting created excitement so affecting the later sleep pattern. Control data were from equivalent times in non-lucid dream nights.

A number of comparisons (e.g. heart- rate before and during lucidity) were made using Sandler's A-test (Sandler, 1955). This is a simple t-test for related samples having a normal distribution, and compares differences between pairs of scores. The sum of the square of each of these differences is divided by the square of the differences. The resultant value of A is referred to tables, using N—1 degrees of freedom. Values equal to or less than the table value are significant. Normality of the data was established by applying the Shapiro-Wilk (1965) test to the data.

A computerized correlation program (N31C), (University of Liverpool Computer Laboratory), was used for cross-correlation of data. This provided a matrix of values of Pearson's coefficient of linear correlation and tables of means and standard deviations for the equal-sized data matrix.

VIII.3 RESULTS:

This investigative 1st A.W. study eventually covered 45 nights, over a period of approximately 1 year, before 8 lucid-dreams were recorded. On 3 other occasions the S had a lucid-dream, but the results were not monitored for one reason or another. Table VIII.1 on page 162 displays the raw-data obtained. Six lucid-dreams occurred in complete all-night records, but there were gaps in the 2 other records. Consequently, comparisons of sleep stages between lucid-dream and Control nights were made using 6 samples each. Other comparisons used data from 8 dreams in each group.

A. Basic findings for this one subject:

a/ The Stage of sleep in which lucid-dreams occur.

All the lucid-dreams happened in unambiguous Stage REM sleep according to the scoring criteria of Rechtschaffen & Kales (1968).
Ocular signals are shown on pages 163 to 170, and pictures of the whole sleep record for the duration of each lucid-dream are displayed on pages 171 to 177. (See also sleep-patterns: 178,179 and 375, 376).

b/ Duration of lucid-dreams.

The lucid-dreams continued for 51-354 seconds (from signals to rousing), giving a mean length of 153 seconds.

c/ Time of occurrence of lucid-dream.

The dreams happened from 2,32 a.m. to 9.04 am., with 5/8 lucid-dreams occurring between 5 and 8 a.m.

d/ Sleep-patterns of lucid-dreams V5. Control nights.

Nine sleep-measures (% - up to and including lucid-dream- Stage 1,2,3,4, REM, awake, actual lights-out time, sleep-onset time, total sleep time) were compared using Sandler's A test, but no significant differences emerged (Appendix, pages 372-374).

A values were, respectively; 0.31, 0.56, 2.7, 3.4, 75.2, 0.86, 3.1, 27.3, 1.8 (5 d.f.).

e/ Latency into the REMP when the lucid-dream occurs.

The lucid-dreams occurred from 2.12 to 51 minutes into the particular REMP, mean: 23.95 mins (decimal).

f/ Lucid-dream REMP disturbances. (Figure VIII.17, page 180).

In case lucid-dreams were associated with a lighter, more disturbed REMP than ordinary dreams, the number of sleep-disturbances in each lucid-dream REMP was compared to Control data. A sleep-disturbance was defined as any noticeable increase in EMG in the Polygraphic record. Such activity accompanies any physical movement in the sleeping subject (Rechtschaffen & Kales 1958). No significant difference was found (A = 0.35; 7 d.f., n.s.).

g/ Physiological correlates of arousal in lucid-dreams vs. Control dreams.

Mean heart-rate in the lucid-dream was not significantly different from that in Control REMPs (A = 0.5; 6 d.f., n.s.). REM activity, however, was significantly greater in lucid-dreams than Control REMPs (A = 0.15; 7 d.f., P < 0.01).

h/ Physiological correlates of arousal before and during lucidity.

The mean amount of REM activity during the lucid-dream was not significantly different from the mean amount before lucidity (A= 0.32; 7 d.f., n,s.). However, there was a significant increase in heart-rate during the lucid-dream compared to that before, taking a 1 minute measuring period, and allowing 20 seconds up to the start of signaling, during which time the S was achieving lucidity (A= 0.25; 7 d.f., P < 0.05). A similar increase was not found in Control dream periods obtained from non-lucid-dream nights at equivalent times (A= 3.8; 6 d.f., n.s.), but when the Control measures were obtained after a REM burst (as occurs in the lucid-dream) a significant effect was also shown (A= 0.19; 7 d,f., $P < 0.05$).

j/ A consistent effect:

When lucidity occurred it always followed, within 5seconds (mostly 2-3 seconds) of a REM burst or sequence - the preceding length of which varied from 6 to 55 seconds, mean: 21.6. A REM burst was defined here as a period of REM activity appearing in total to be separate from the relatively inactive background EOG record.

VII.3.B Cross-correlational findings

(a) Nine measures based on 8 lucid-dreams. (Figure VIII.18, page 181).

The following pairs of measures attained statistically-significant levels of association, using N—2 degrees of freedom, 2-tailed, and the 5% level of significance as a minimum:

1/ Length of pre-signal REM burst.

Heart-rate during the lucid-dream. (1st minute).

$r = +0.87$ $P < 0.01$

The question arises as to whether this association is due to a common excitatory process independent of any dream events, or whether dream events and mentation are causing the increased REM activity and consequent elevation in heart-rate. Subjectively the S reported that he always felt excited at achieving lucidity, but this feeling may have been ‘rationalised’ from a burst of heightened autonomic activity.

2/ Heart-rate during the lucid-dream. (1st minute)

Heart-rate before lucidity. (1 minute)

$r = +0.79$ $P < 0.02$

This association tends to indicate that there is a strong autonomic influence in lucid-dreams. Order and calm, reflected in a slower heart-rate, do not generally result from the insight that one is dreaming.

3/ Latency of lucid-dream into the REMP.

REM amount before lucidity, in that REMP.

$r = -0.77$ $P < 0.05$

This finding indicates that the longer the pre-lucid REM period, the less REM occurs. This is not necessarily characteristic only of lucid-dream REMPs. In general, the later REMPS are indeed longer, with less REM.

4/ Length of pre-signal REM burst.

Time of night of lucid-dream.

$r = -0.70$ $P < 0.05$

This association states that later lucid-dreams have shorter pre-signal REM bursts. This probably reflects the fact that REM is more sparse in later REMPs.

(b) Eighteen measures based on 6 lucid-dreams. (Figure VIII,19, page 182)

(c)

Pairs of measures attaining significant levels of association were:

1/ Lights-out time.

Sleep-onset time. (lst k-complex)

$r = +0.97$ $P < 0.01$

2/ Time of night of lucid-dream.

Total sleep time.

$r = +0.90$ $P < 0.02$

These associations are obvious and expected.

3/ REM amount in lucid-dream.

Heart-rate in lucid-dream.

$r = 0.89$ $P < 0.02$

This association mirrors the link between REM and heart-rate found too in ordinary dreams. (Gassel et al., 1964).

4/ REM amount before lucidity.

Disturbances in lucid-dream REMP.

$r = -0.88$ $P < 0.02$

Disturbances in a REMP cause interruptions of REM activity. This finding supports that common observation.

5/ Heart-rate in lucid-dream. (1st minute)

Length of pre-lucid REM burst.

$r = -0.87$ $P < 0.05$

This strong association was discussed in the previous section on measures from 6 lucid-dreams.

6/ Latency of lucid-dream into REMP.

% Stage REM.

$r = +0.84$ $P < 0.05$

This is an expected association.

7/ Duration of lucid-dream.

% Stage 4.

$r = -0.83$ $P < 0.05$

This association states that the longer the lucid-dream the less the amount of Stage 4 sleep precedes it. Since the percentage of Stage 4 sleep declines in the night it might seem that this link indicates that later lucid-dreams are longer, however the association between time of lucid-dream and duration is not significant ($r = 0.45$). Therefore, this link perhaps suggests that the interplay of sleep stages can influence the duration of lucid-dreams in some way.

8/ Heart-rate before lucidity.

REM amount in lucid-dream.

$r = +0.82$ $P < 0.05$

This is a physiological link as previously discussed.

VII.4 DISCUSSION

Findings.

The 8 lucid-dreams analysed with Control dreams for this study revealed important basic information about lucid-dreams - at least in this one S. It has been shown that the dreams all occurred in Stage REM sleep. Taking this to be approximately 25% of total sleep time, the probability of these lucid-dreams all occurring in REM by chance is $P = (0.25)^8 = 0.000015$. Lucidity was always initiated not in quiescent, tonic REM, but in a burst of 'fully blown' REM activity, so reinforcing the link between the lucid-dream and REM sleep. In addition, the lack of any sleep disturbances just before lucidity points to the S being firmly established in Stage REM.

This subject's typical lucid-dream lasts some 2.5 minutes, happening at 6.30 a.m. - some 24 minutes after the beginning of the REMP. Lucidity signals always appeared at the end of a REM burst averaging 22 seconds in length.

There seemed to be no difference between lucid-dream nights and Control nights. The 9 measures compared showed no special characteristics for the lucid-dream recording nights. Similarly, lucid-dream REMP5 did not differ significantly from Control REMPs.

The finding that heart-rate increased significantly after lucidity from that beforehand appeared to be an interesting discovery, especially as Control periods from non-lucid-dreams did not reveal such an increase. However, it was later realised that a better Control would be to compare 1-minute samples in non-lucid-dream REMPs before and after a REM burst - since lucidity is always initiated in a REM burst. This control comparison was performed, and a similar increase in heart-rate was apparent in those measures too (A = 0.19; 7 d.f., $P < 0.05$). Hence, the increase in heart-rate during lucidity is almost certainly a function of some general excitatory process associated with REM rather than due to psychological factors within the dream. A further comparison of heart-rate in the lucid-dream and in Control REMPs after a REM burst revealed no significant difference between these measures (A= 0.5; 6 d.f., n.s.). Similarly, the finding that REM activity in the lucid-dream, although not greater than that before lucidity, was significantly different from that measure in Control REMPs, afforded a different picture when the Control measures were after a REM burst (matched for similar time of night and duration). No effect was then observed (A = 0.61; 7 d.f., n.s.). These findings illustrate that care must be used in interpreting such results, and that suitable, comparable, Control situations must be employed.

The results also demonstrate that it is possible to predict, fairly accurately, the relative heart-rate in a lucid-dream from the length of the pre-lucid REM burst. This offers compelling evidence that the emotional level of the dream is pre-determined by neuro-physiological processes that cause REM bursts and associated increase in heart-rate. It is possible that a long pre-lucid REM burst is associated with an 'active' dream, with high heart-rate. This could interfere with attempts by the dreamer to orientate and think clearly within the lucid-dream. Since later lucid-dreams tend to have shorter REM bursts these dreams may be more lucid than earlier ones.

Two other results are potentially important. The first is the finding that the amount of REM in the lucid-dream REMP correlated significantly with the latency of the lucid-dream, suggesting that perhaps a certain minimum amount of

REM is required before lucidity may be attained. It could be that
(a) Physiologically: a certain level of 'cortical bombardment' from the reticular formation has to occur, or that (b) Psychologically: enough dream-thoughts must be allowed before the topic of authenticity of the environment is touched upon. The second result is the link between % Stage 4 and duration of the lucid-dream. The consequent assumption that later lucid-dreams might be longer was shown not to be tenable. A likely explanation is that there is more room for the lucid-dream when Stage 4 sleep is reduced.

Other points:

1/ The scanning hypothesis and eye-signals.

Regarding the 'scanning' hypothesis of eye-movements in dreams, the demonstration that deliberate eye-signals can be made in REM sleep must support that notion - certainly, the motor ability is present. This author is of the opinion that most REMs consist of spontaneous non-scanning movements but that some are definite object-fixating or scene-scanning movements.

2/ The pre-lucidity REM burst and non-maintenance of lucidity.

The consistent finding that ocular-signals were always produced after a REM burst is of importance in understanding how lucidity is initiated. A reasonable explanation is that spontaneous neuro-physiological activity causing REMs also stimulates the cortex via the reticular formation, to a level where consciousness is reached within the dream. Once achieved, however, consciousness is not maintained indefinitely. The subject reports that either a slow sinking back' into ordinary dream unconsciousness occurs, or 'the Subject experiences a feeling of waking. The author too, in his own lucid-dreams experiences an inexorable decline of lucidity despite performing such lucidityreminding tasks such as looking at one's own (dream) hands or thinking repeatedly 'This is a dream'. Therefore, presumably, lucidity in dreams is not a welcome phenomenon to the organism and is physiologically suppressed. This is understandable since if people were always conscious in dreams it might be difficult to differentiate dream from reality. In addition, people might tarry too long in that pleasant state and neglect the real world.

3/ Is it possible to fake the signals?

The presence of REMs and low-tonus EMG of REM sleep could just conceivably be faked by a knowledgable S, however the EEG is very characteristic and is not considered possible to emulate when awake (Schwartz & Fischgold,1960). Nevertheless, to be totally thorough an experiment in which simulating Controls attempt to fake the signals was called for. (This is reported in Chapter XI).

4/ Is a 2-way communication system possible between S and E?

The study so far has demonstrated that the S can communicate to the outside world. An obvious progression would be to establish a 2-way link. This would be important in determining for instance the mental functioning of the lucid-dreamer by the S's direct involvement in various tests of memory, intelligence, personality, etc., and also to demonstrate the temporal continuity of lucidity in the dream. (Experiments in 2-way communication are described in Chapter XIII).

VIII.5 CONCLUSIONS.

The ocular signaling method of marking lucid-dreams in the polygraphic record and reporting information to the external world, has enabled, for the first time, much basic knowledge about lucid-dreams (in this Subject at least) to be ascertained. An important point is the fact that they are indeed dreams from Stage REM sleep. It is recognised though that this may not be so in all people who report lucid-dreams. There may be cases of waking imagery superficially masquerading as lucid-dreams.

Another factor that needs to be borne in mind is that lucid-dreams might also occur in other stages of sleep, but that the musculature may be too 'sluggish' for signaling. Added to which the memory of such events might be erased on waking from that state. Nevertheless, a Stage REM lucid-dream phenomenon has been discovered in man.

Having catalogued the electrophysiological data from this 1st A.W. study, the next Chapter presents the Psychological information which has been determined.

DREAMS

SLEEP-RECORD MEASURES	A	B	C	D	E	F	G	H	MEAN:
1. LUCID DREAM NIGHTS.									
1. Duration of lucid-dream (secs)	120	180	104	130	205	80	51	354	153
2. Pre-lucidity latency in that REMP (mins)	28	13.5	2.12	45	10	28	14	51	23.95
3. Time of lucid-dream (a.m., decimal)	8.12	5.23	6.5	7.85	5.3	2.54	9.7	7.31	6.56
4. Length of pre-signal REM burst (secs)	6	11	12	11.5	38	54.5	21	19	21.6
5. Mean REM amount, before lucidity	.95	.79	2.25	.49	1.4	1.0	2.1	0,7	1.2
6. Ditto, in lucid dream	2.6	1.0	1.5	1.75	2.1	2.5	2	1.2	1.8
7. Heart-rate, before lucidity (over 1 min)	70	64	76	73	79	76	66	66	71
8. Ditto, during lucidity	72	69	73	73	82	80	73	73	74
9. Disturbances up to lucidity	12	4	0	22	3	8	4	15	8.5
10. Lights-out (mins about midnight)	-	24	107	26	40	15	-	-60	25.3
11. Sleep-onset (from 1st k-complex)	-	0.75	2.12	0.78	1.17	0.49	-	-0.04	0.88
12. Total sleep time (hrs)	-	3.8	4.4	6.2	4.3	2.2	-	7.5	4.7
13. Percentage Stage 4	-	8.8	11.8	14.6	0.5	19.1	-	1.5	9.38
14. Ditto, Stage 3	-	9.1	18	12	6.5	9	-	10.6	10.87
15. Ditto, Stage 2	-	36.2	44	24.3	59.2	38.1	-	50.8	42.1
16. Ditto, Stage 1	-	17.4	7.3	11.9	13.7	11.4	-	6.6	11.38
17. Ditto, Stage REM	-	5.9	11.1	18.9	11.96	17.4	-	20	14.2
18. Ditto, Awake	-	22.8	7.8	18.2	8.3	5	-	10.4	12.1

(Measures 12-18 are up to & including the lucid-dream)

Controls:

2. NON-LUCID DREAM NIGHTS.	I	J	K	L	M	N	O	P	MEAN:
19. Mean REM amount (per page)	1.1	.79	.75	.9	.9	.77	.67	.63	.81
20. Heart-rate (early REMP)	72	66	68	73	71	76	67	-	70.4
21. Ditto, (late REMP)	77	66	75	72	71	72	65	-	71
22. Lights-out (mins about midnight)	-	8	83	66	52	0	-	-19	31.7
23. Sleep-onset (from 1st k-complex)	-	.45	1.6	1.28	1.21	.35	-	.22	.85
24. Total sleep time	-	4.67	4.57	7.36	4.23	2.18	-	6.65	4.9
25. Percentage Stage 4	-	2.55	10.48	7.77	10.7	17.2	-	0	8.1
26. Ditto, Stage 3	-	9.6	14.35	10.6	8.6	22.4	-	8.3	12.3
27. Ditto, Stage 2	-	68	54	49.2	56.5	43.7	-	39.6	51.8
28. Ditto, Stage 1	-	4.46	7.1	6.2	7.27	5.5	-	7.7	6.37
29. Ditto, Stage REM	-	11.15	8.87	24.5	7.1	5.9	-	25.9	13.9
30. Ditto, Awake	-	4.3	5.16	1.76	9.75	4.8	-	18.48	7.4
31. Disturbances	2	4	0	13	2	4	5	17	5.9

(Measures 25-30 are for equivalent LD times)

TABLE VIII.1 **1st A.W. STUDY**

FIGURE VIII.1

LUCID DREAM A. Subject : AW

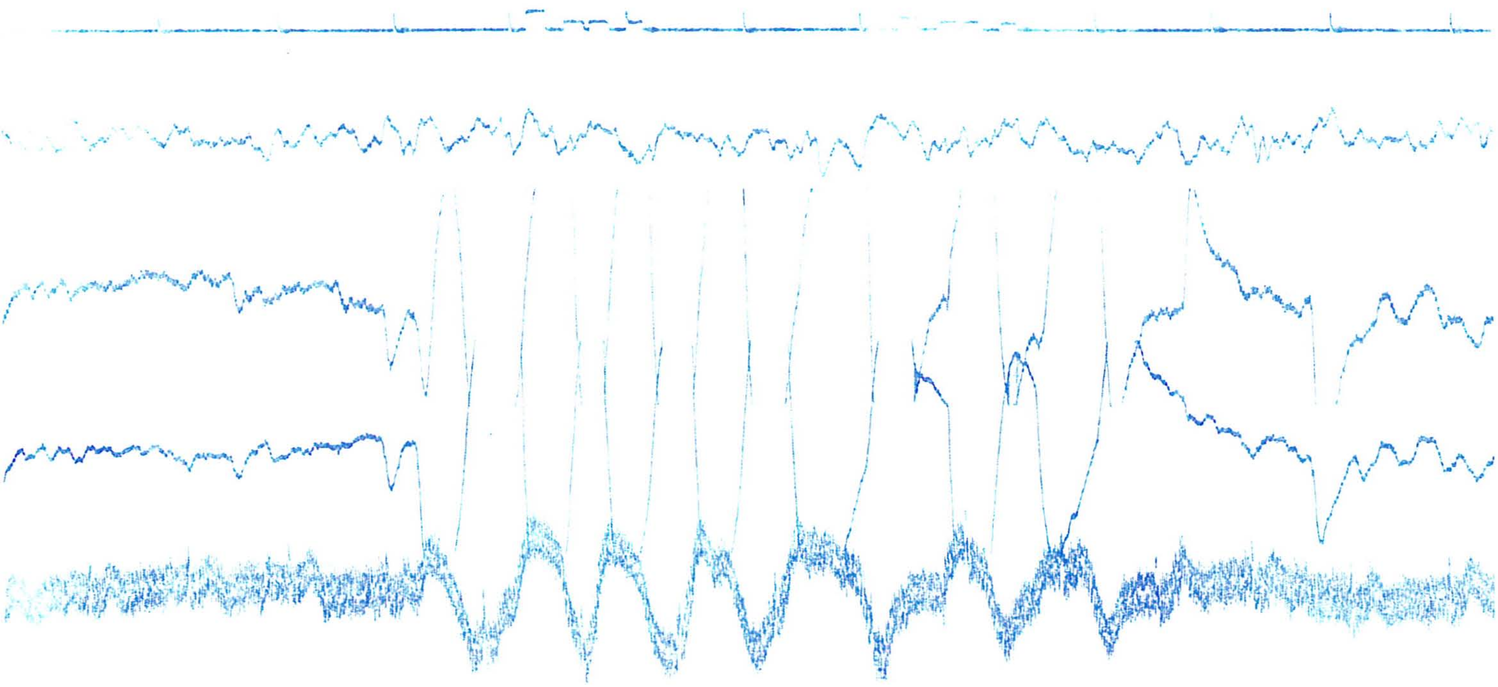
Eléma-Schönander Mingograf

EEG gain : 70μV/cm. Time constant : 0.3 secs.

EOG gain : 70μV/cm. TC : 0.3 secs.

EMG gain : 20μV/cm. TC : 0.015 secs.

FIRST EVER RECORDED OCULAR SIGNALS FROM A PERSON IN A LUCID DREAM - Approx. 8am on the morning of 12th April 1975 at Hull University, England.
(Original in the Science Museum, London.)



You may reproduce in any publication the above chart-recording, without contacting Dr Hearne, however you must in that publication state the source:
Hearne, Keith M.T. (1978) Lucid-dreams: an electro-physiological and psychological study. PhD thesis. University of Liverpool, England. (May 1978).

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FIGURE VIII.2
LUCID-DREAM B.

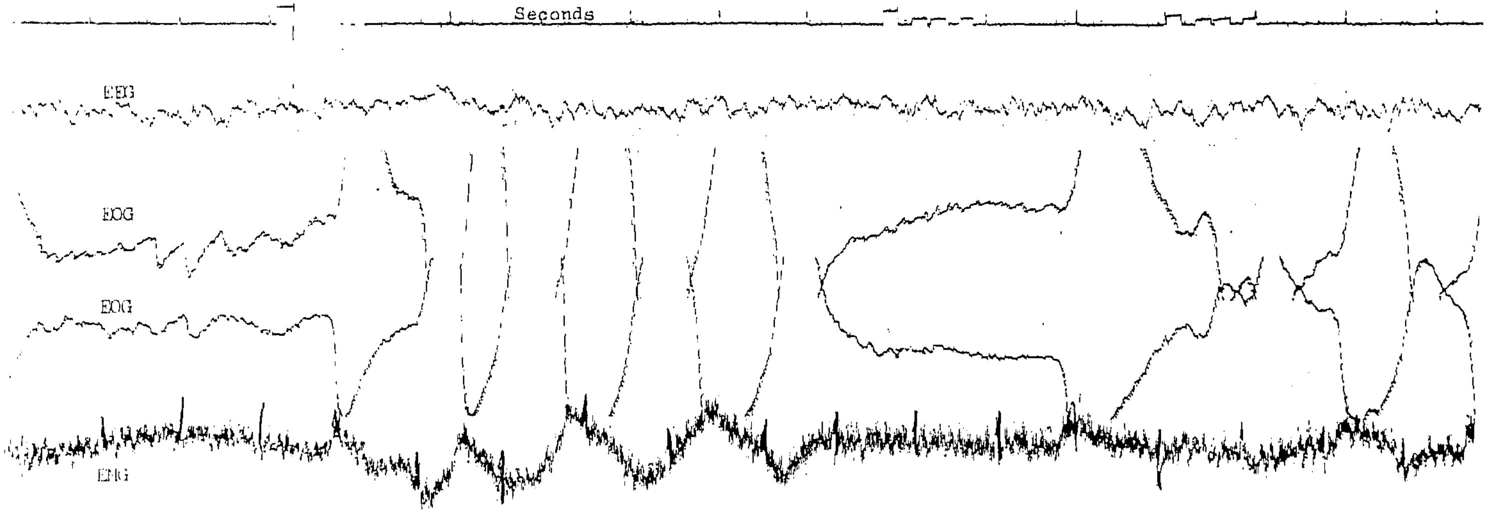


FIGURE VIII.3
LUCID-DREAM C.

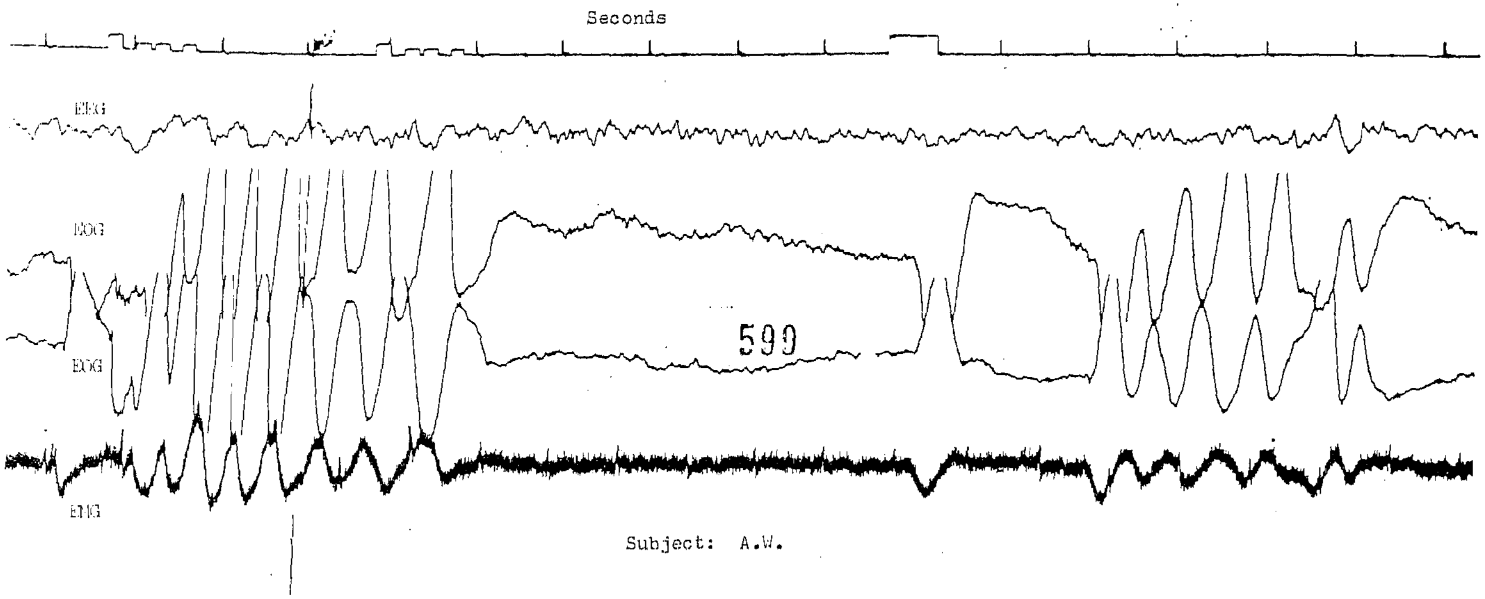
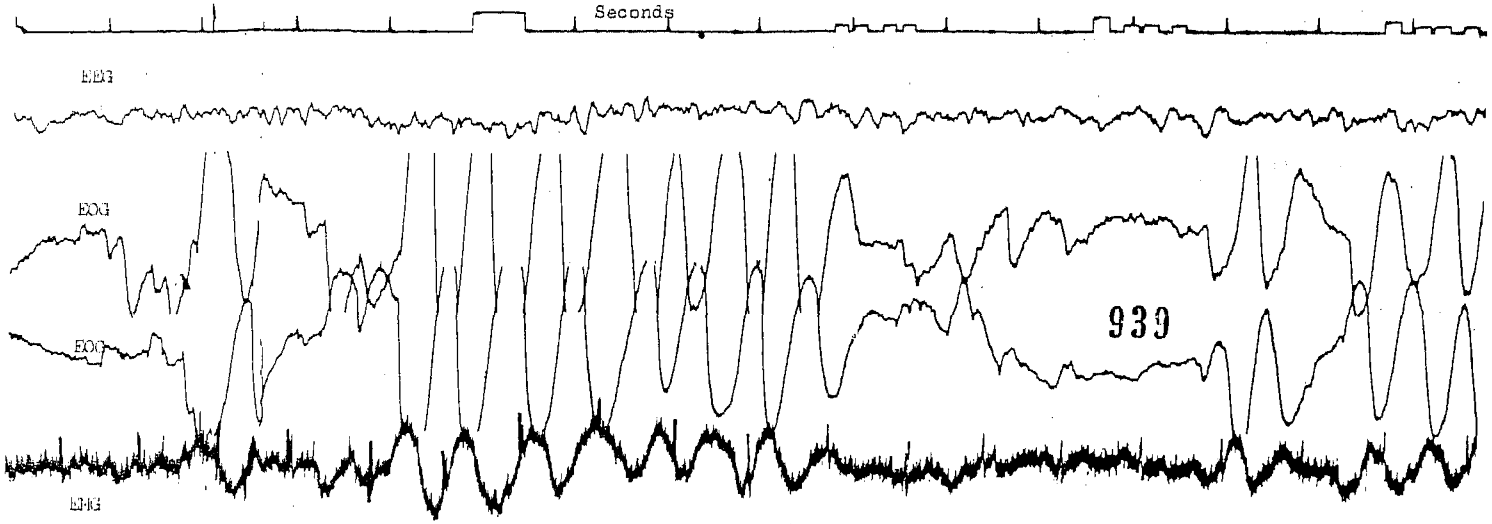


FIGURE VIII.4
LUCID-DREAM D.



Subject: A.W.

FIGURE V.III.5

LUCID DREAM E. Subject : AW

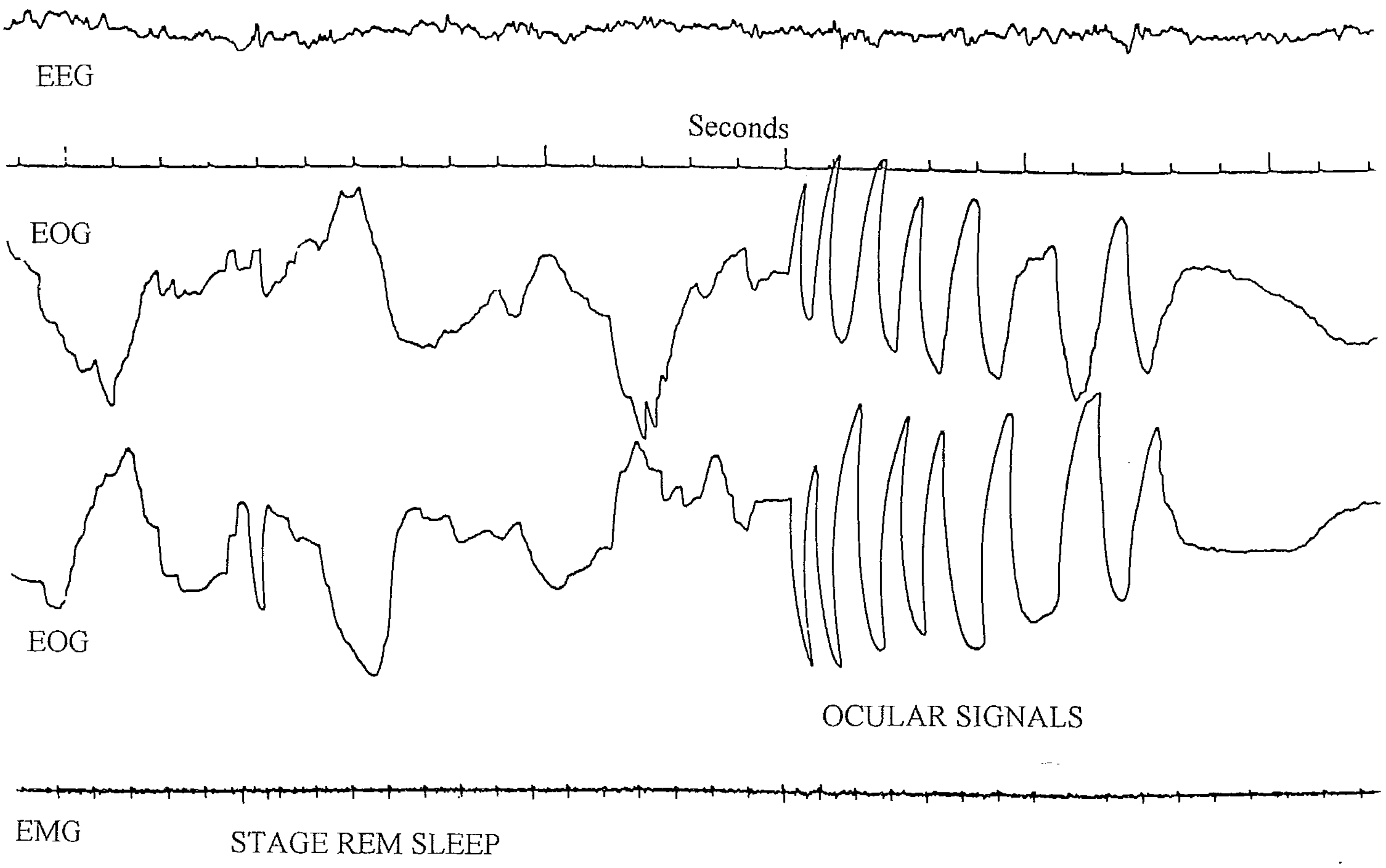
Grass Polygraph

EEG gain : 75μV/cm. Time constant : 0.45 secs.

EOG gain : 100μV/cm. TC : 0.45 secs.

EMG gain : 0.1mV/cm. TC : 0.015 secs.

TYPICAL OCULAR SIGNALS FROM A PERSON IN A LUCID DREAM (Original in the Science Museum, London.)



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Hearne, Keith M.T. (1978) Lucid-dreams: an electro-physiological and psychological study. PhD thesis. University of Liverpool, England. (May 1978).

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FIGURE VIII.6
LUCID-DREAM F.

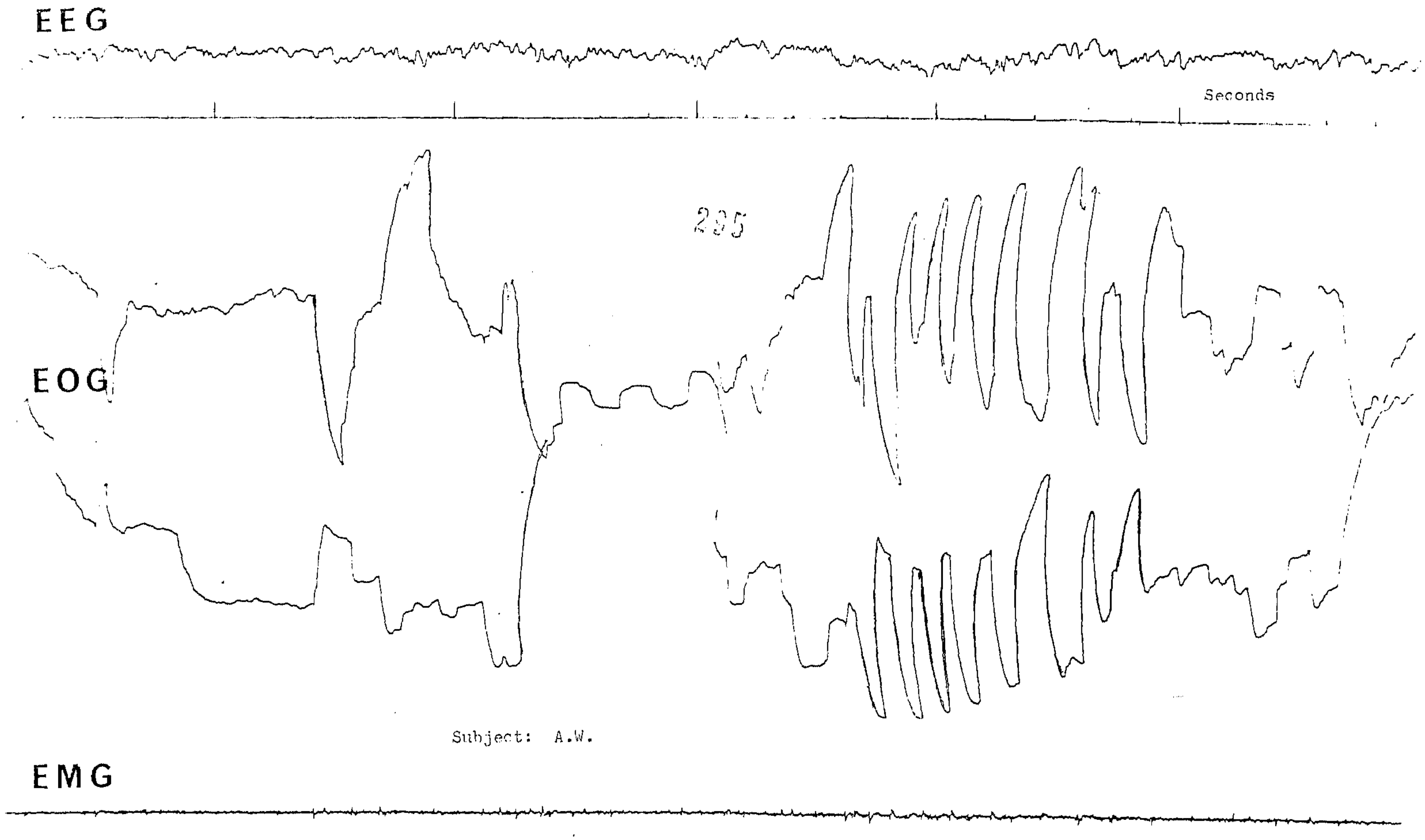
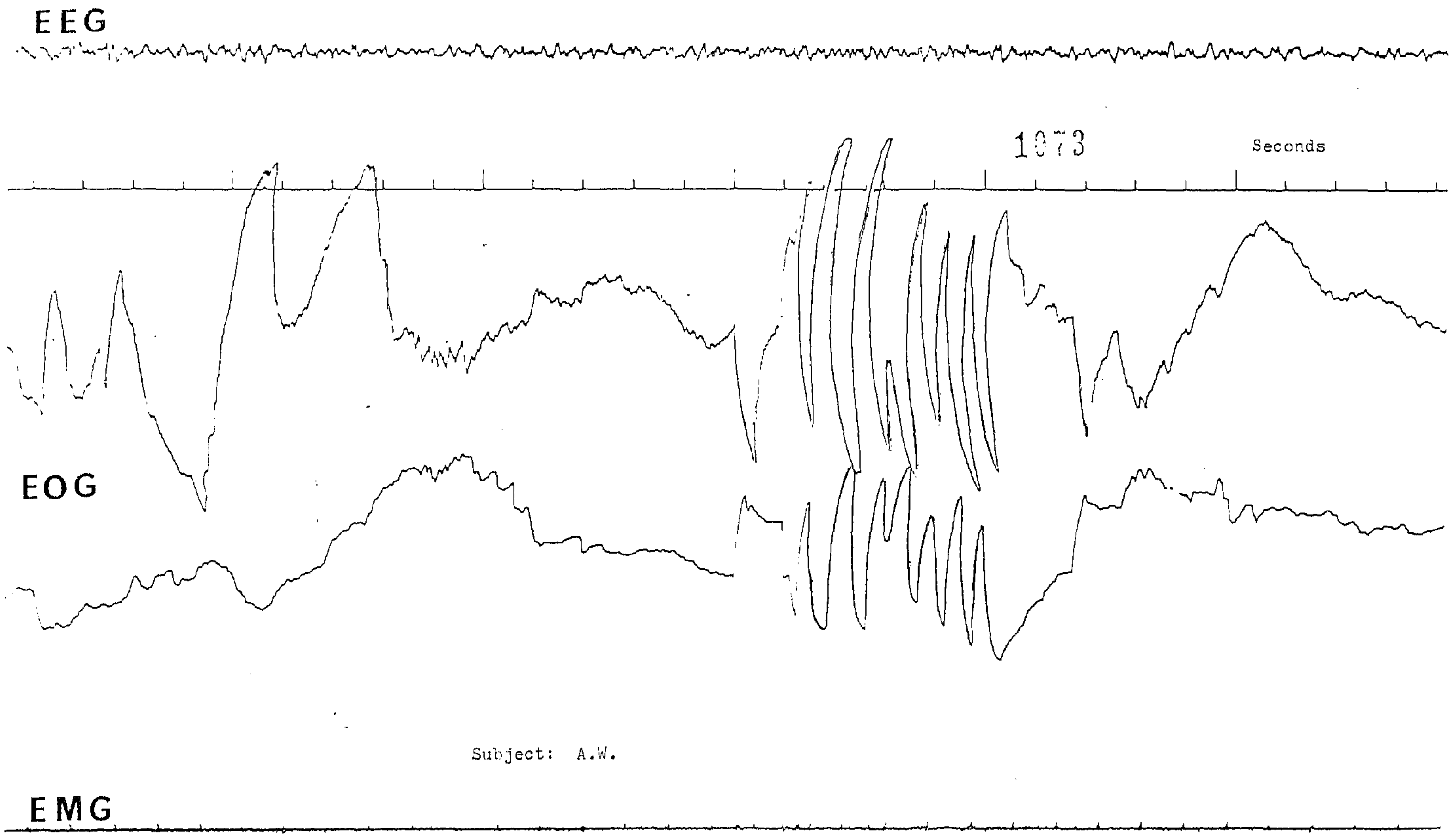


FIGURE VIII.7
LUCID-DREAM G.



Subject: A.W.

FIGURE VIII.8
LUCID-DREAM H.

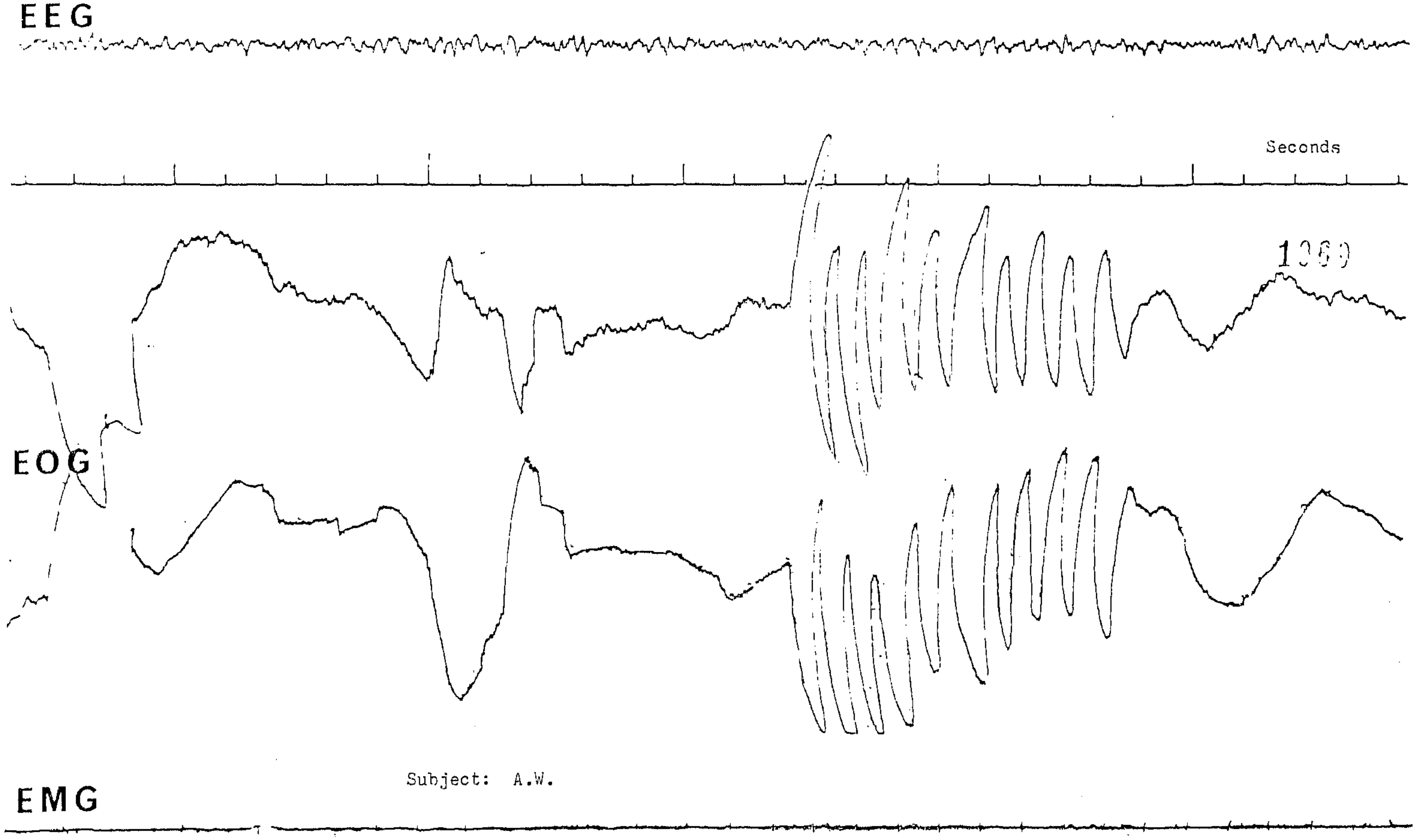
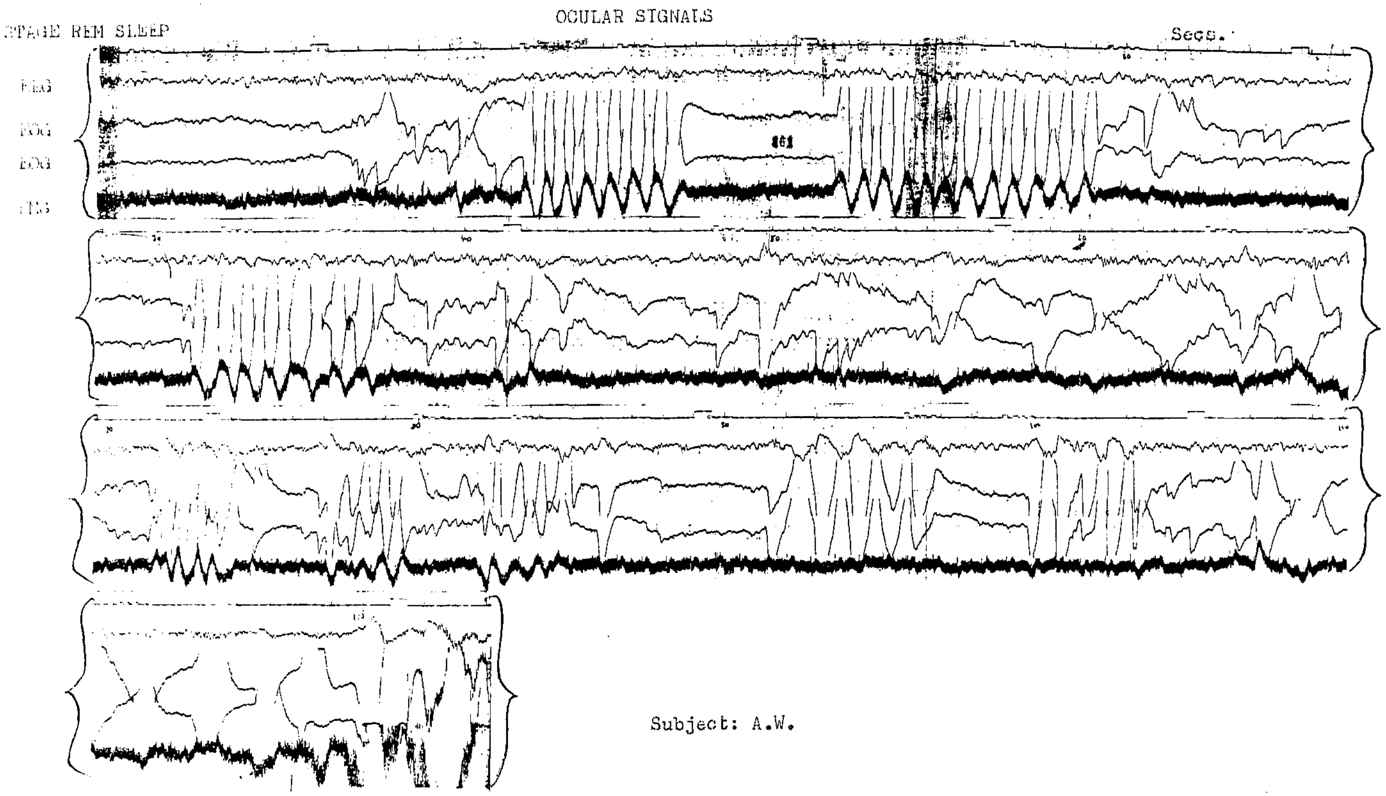


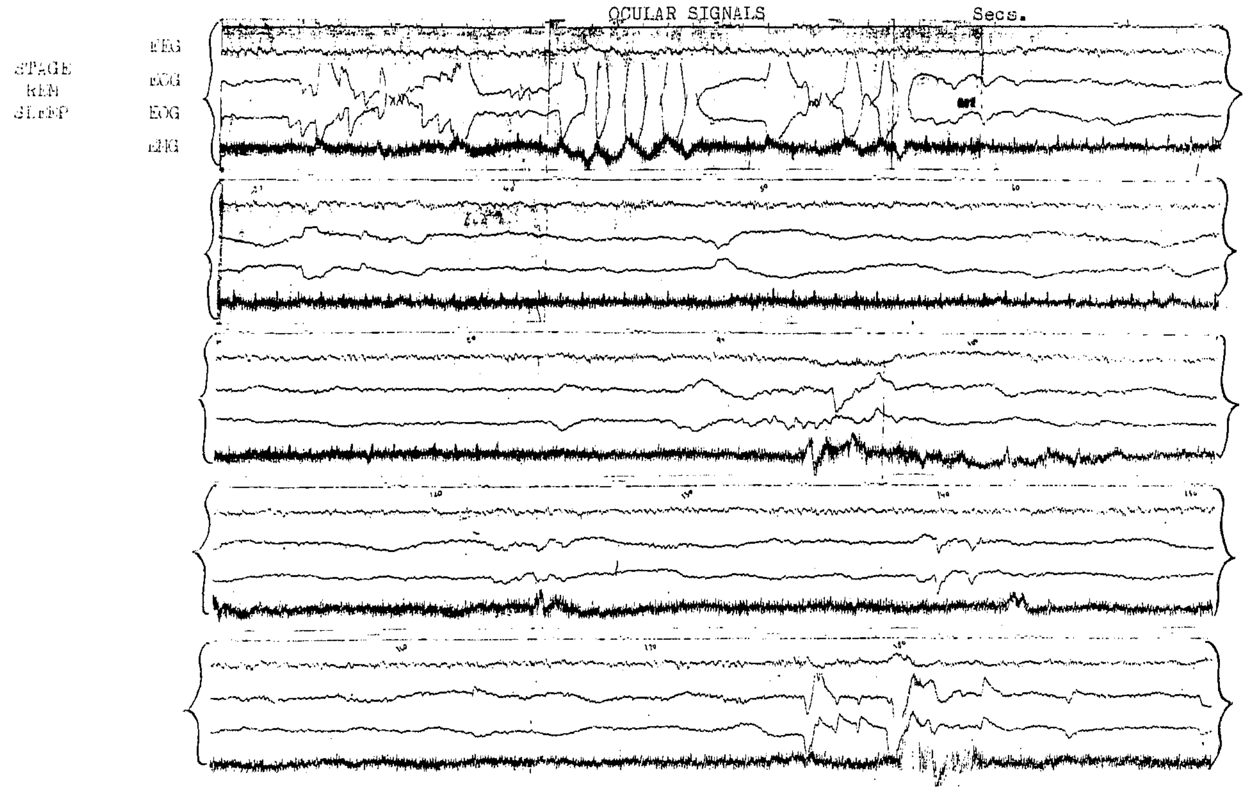
FIGURE VIII.9
LUCID-DREAM A.



Subject: A.W.

POLYGRAPHIC RECORD.

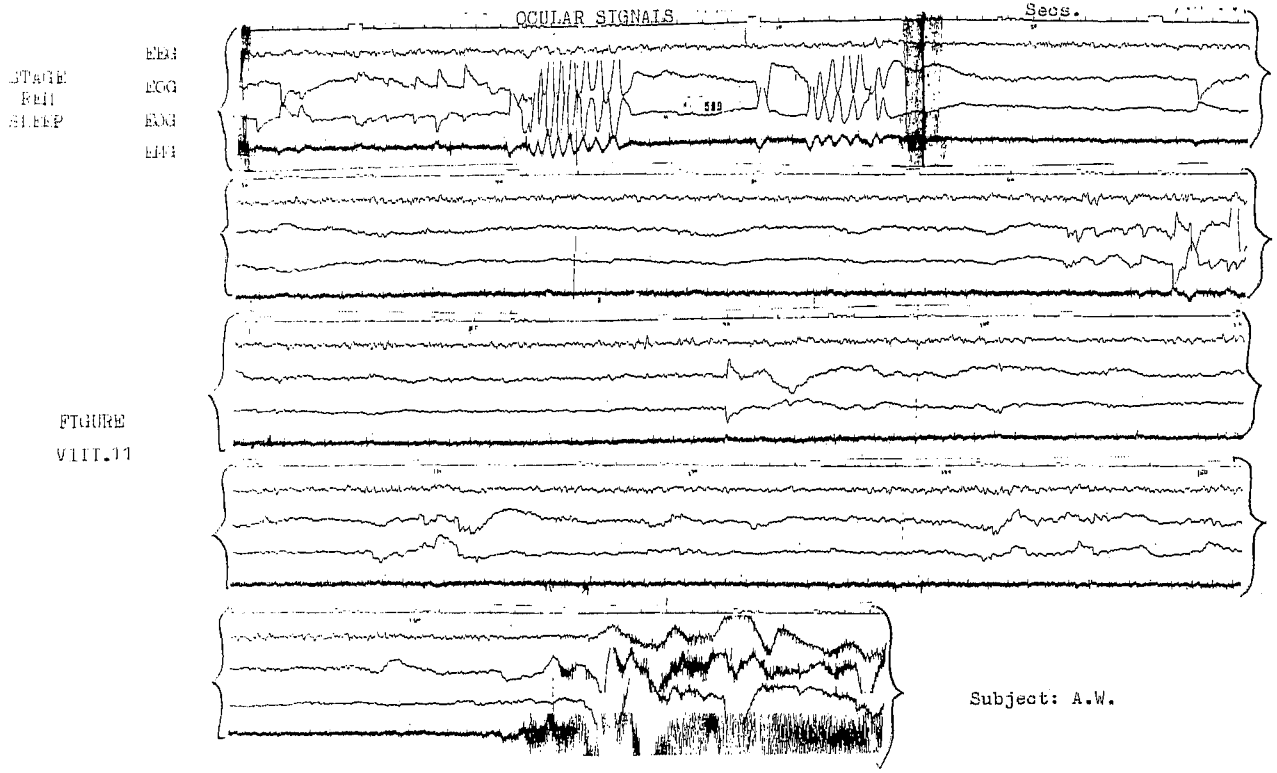
FIGURE VIII.10
LUCID-DREAM B.



Subject: A.W.

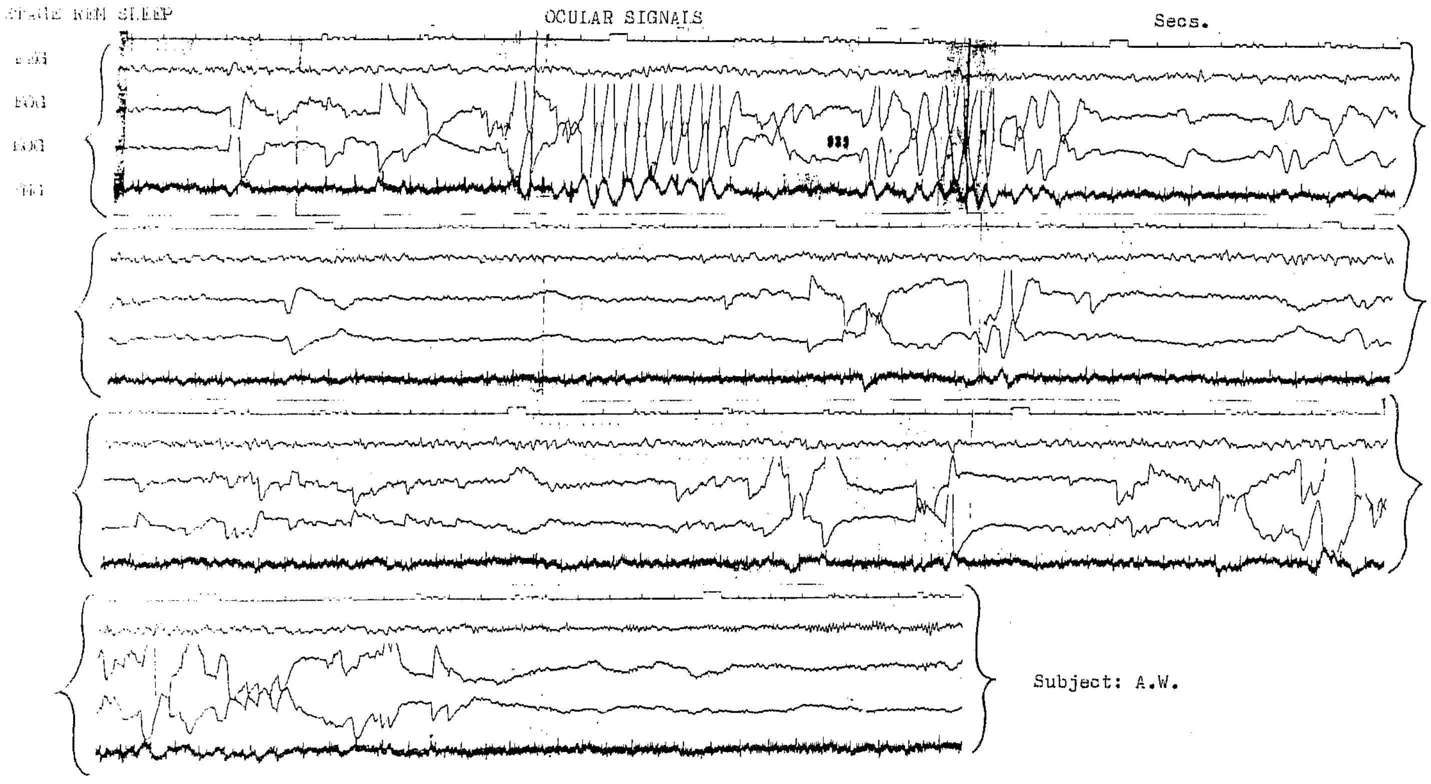
POLYGRAPHIC RECORD.

FIGURE VIII.11
LUCID-DREAM C.



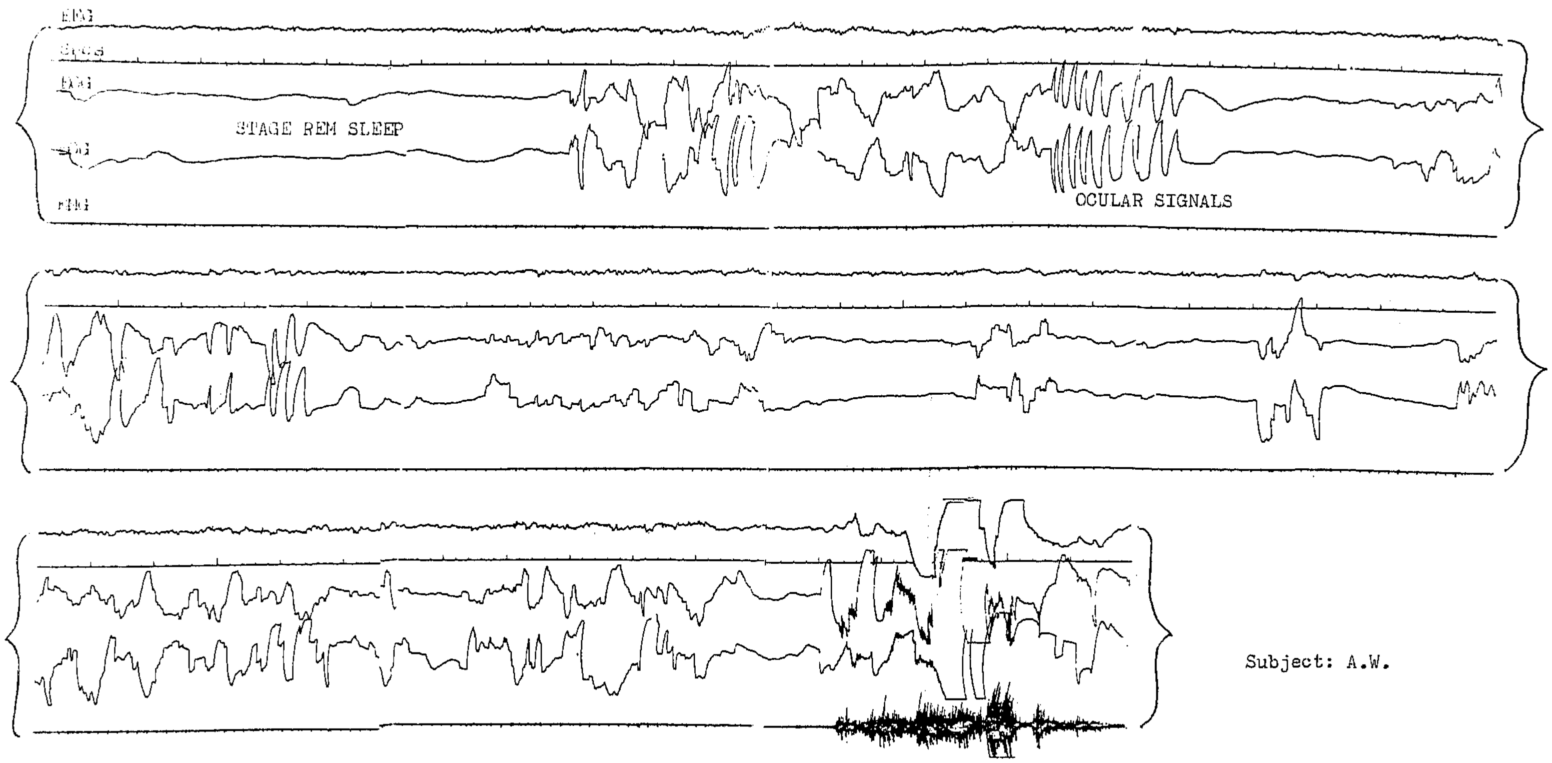
POLYGRAPHIC RECORD.

FIGURE VIII.12
LUCID-DREAM D.



POLYGRAPHIC RECORD.

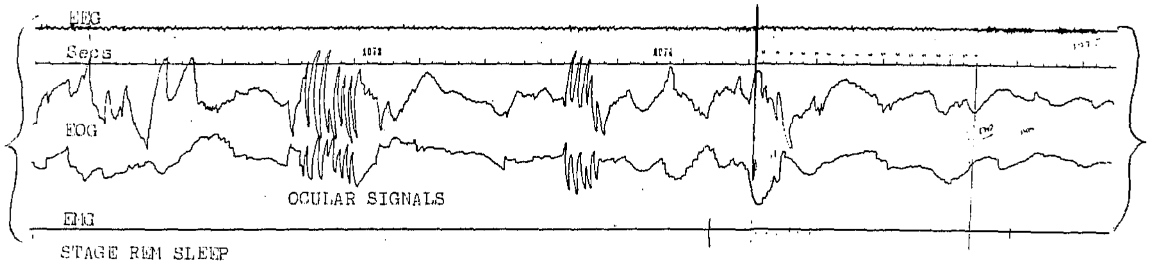
FIGURE VIII.13
LUCID-DREAM E.



Subject: A.W.

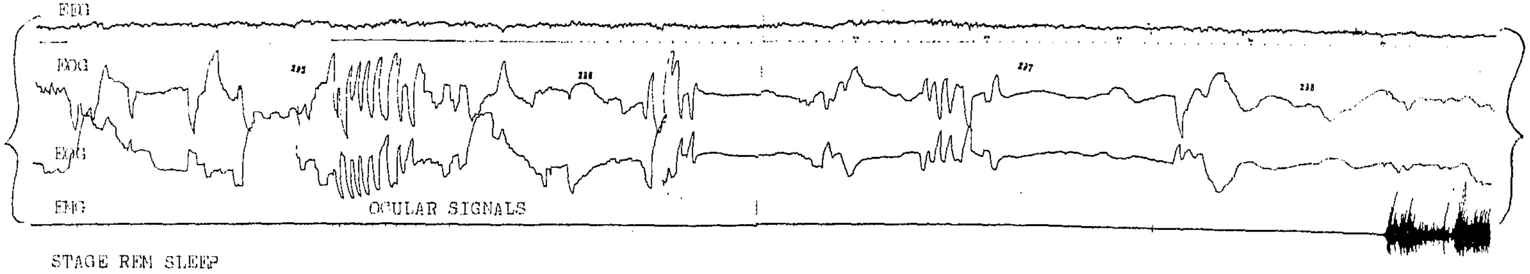
POLYGRAPHIC RECORD.

FIGURE VIII.14
LUCID-DREAM G.



Subject: A.W.

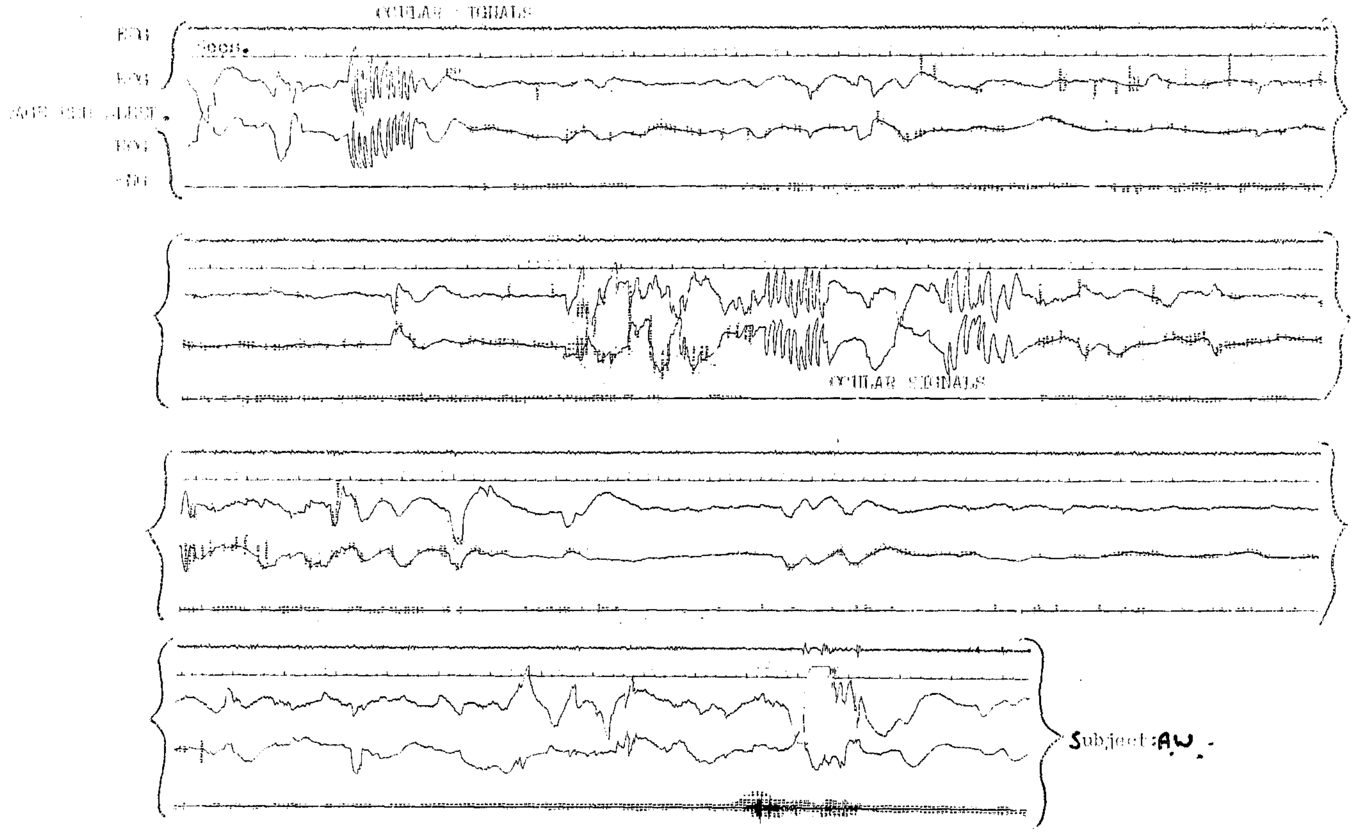
LUCID-DREAM F.

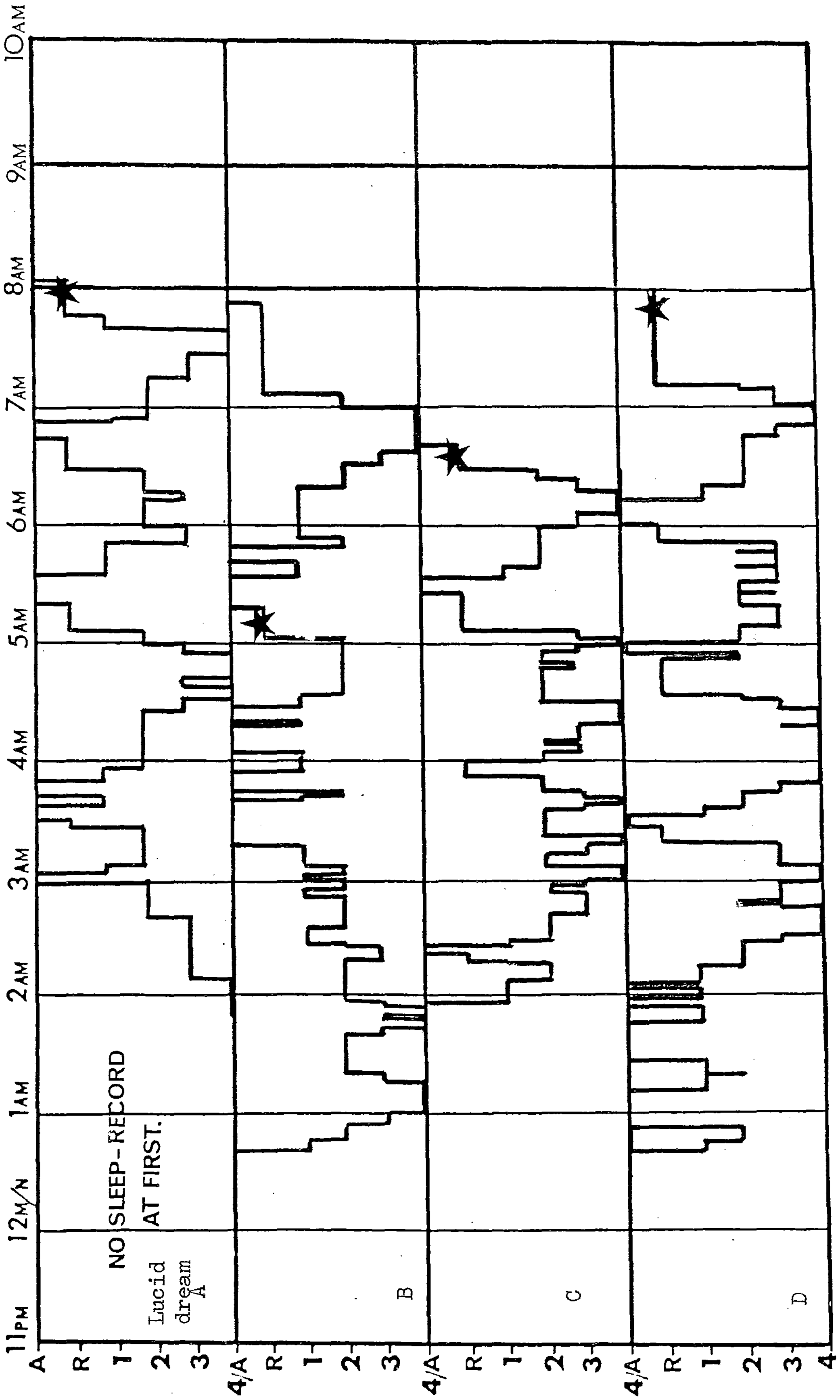


Subject: A.W.

POLYGRAPHIC RECORDS.

FIGURE VIII.15
LUCID-DREAM H.



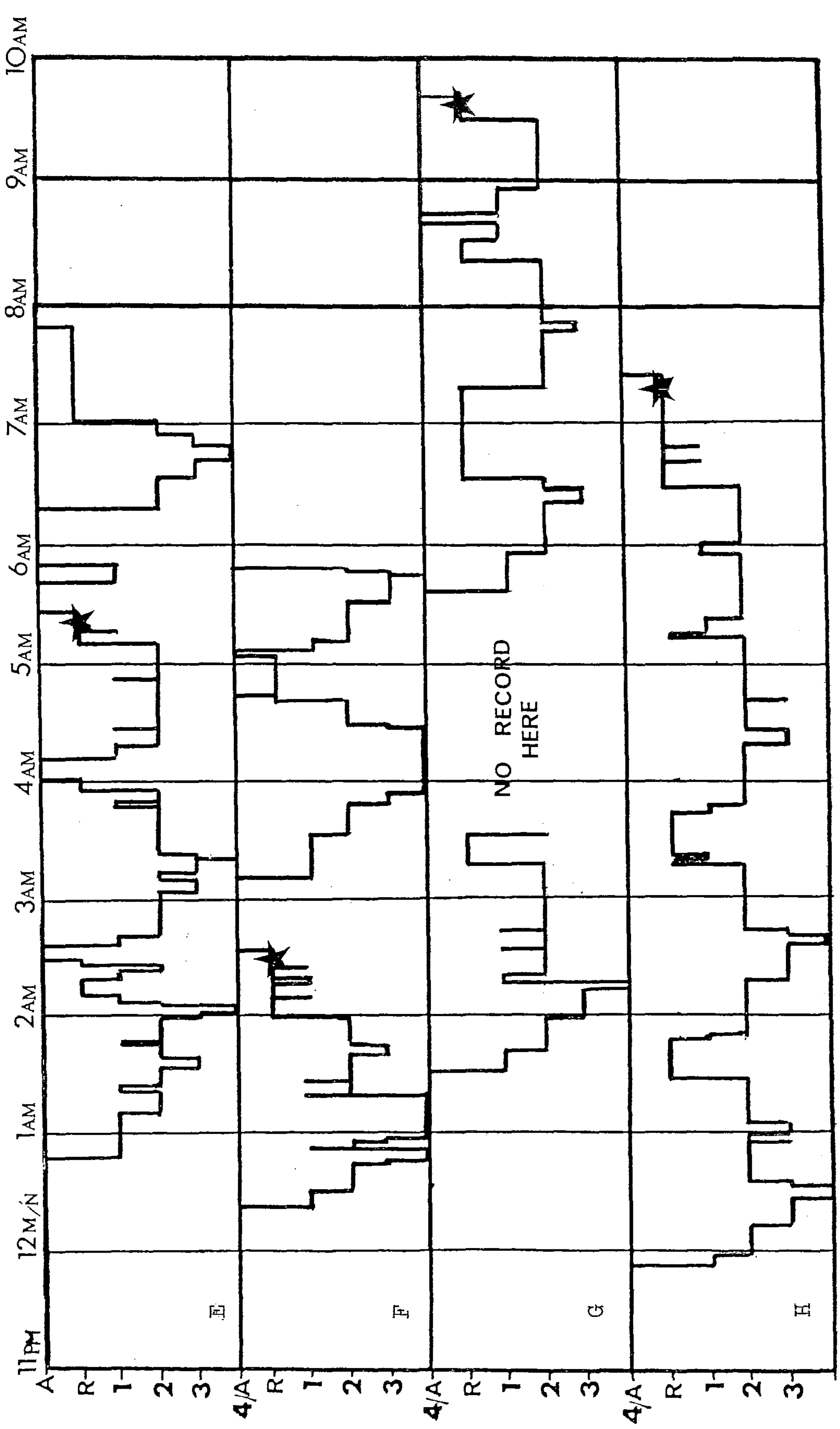


A = Awake, R = REM, and Slow wave sleep Stages 1 -4.

★= Lucid-dream.

FIGURE VIII.16 SLEEP PATTERNS. 1st A.W. STUDY.

1. LUCID-DREAM NIGHTS



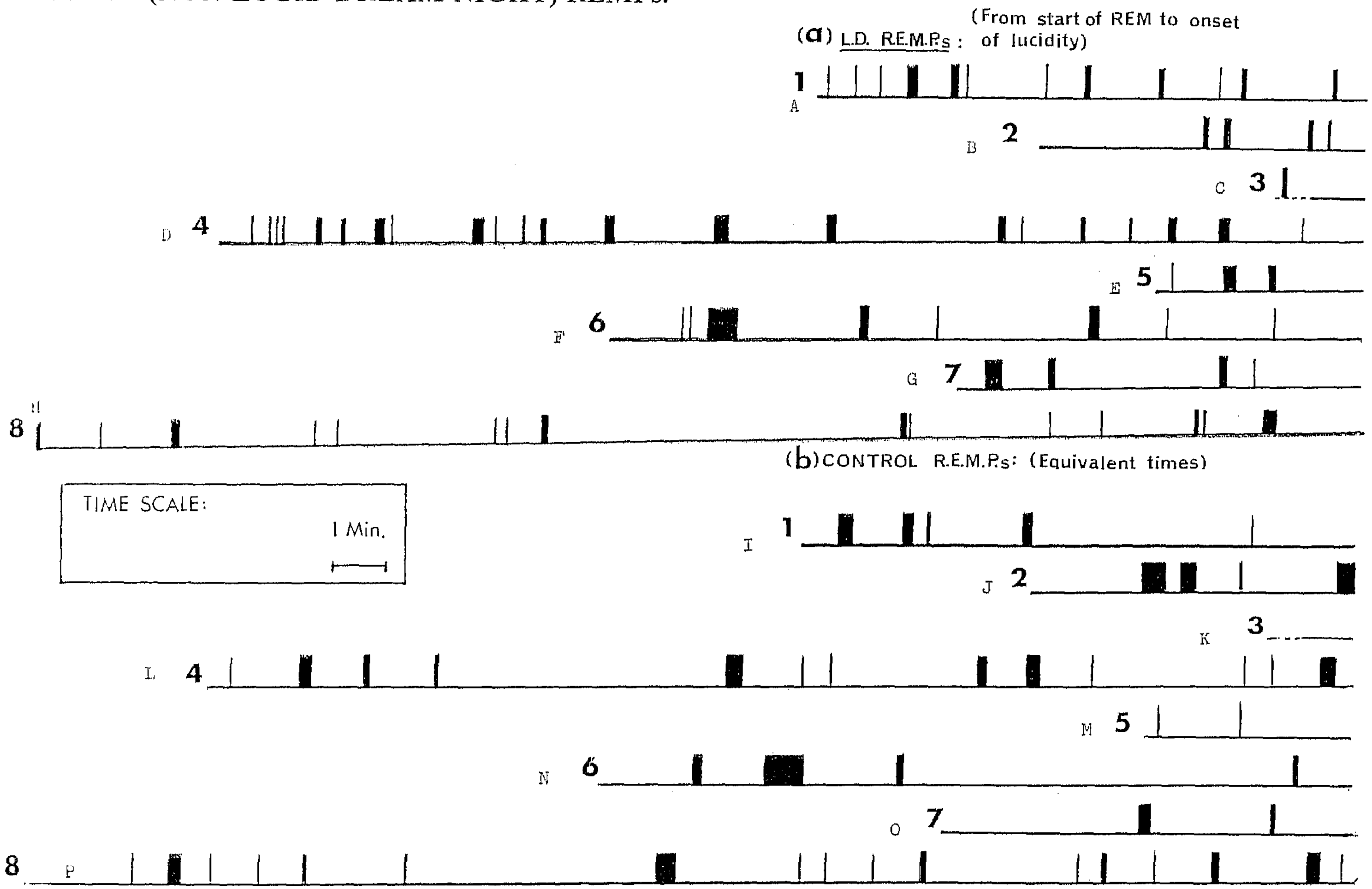
A = Awake, R = REM, and Slow wave sleep Stages 1 -4.

* = Lucid-dream.

FIGURE VIII.16 (Continued) **SLEEP PATTERNS.** 1st A.W. STUDY.

1. LUCID-DREAM NIGHTS

FIGURE VIII.17
SLEEP DISTURBANCES IN LUCID-DREAM REMPs
AND CONTROL (NON-LUCID-DREAM-NIGHT) REMPs.



Significant values of r: (6 d.f.) 5% = 0.71, 1% = 0.83.

1. Duration of lucid-dream
2. Pre-lucidity latency in that REMP
3. Time of lucid-dream
4. Length of pre-signal REM burst
5. Main REM amount, before lucidity
6. Ditto, in lucid-dream
7. Heart-rate before lucidity
8. Ditto, during lucidity
9. Disturbances up to lucidity

1	-							
2	0.49							
3	-0.04	0.15						
4	-0.10	-0.06	-0.70					
5	-0.47	-0.77	0.22	0.04				
6	-0.54	-0.04	-0.08	0.43	0.09			
7	-0.24	-0.26	-0.46	0.52	0.22	0.49		
8	-0.04	-0.11	-0.54	0.87	0.11	0.55	0.79	
9	-0.07	0.62	0.28	-0.13	-0.67	0.40	-0.20	-0.09
	1	2	3	4	5	6	7	8

FIGURE VIII.18 CORRELATIONAL MATRIX
(Based on 8 lucid dreams. Subject: A.W.)

Significant values of r: (4 d.f.) 5% = 0.81; 1% = 0.92.

1	–																
2	0.47																
3	0.45	0.36															
4	-0.23	-0.04	-0.82														
5	-0.34	-0.79	-0.11	0.02													
6	-0.52	-0.05	-0.60	0.86	0.11												
7	-0.54	-0.38	-0.28	0.54	0.55	0.82											
8	-0.17	-0.14	-0.53	0.87	0.20	0.89	0.80										
9	0.05	0.70	0.15	0.06	-0.88	0.19	-0.15	0.03									
10	-0.74	-0.81	-0.09	-0.14	0.78	0.17	0.57	0.05	-0.50								
11	-0.56	-0.81	0.07	-0.23	0.87	0.05	0.54	0.02	-0.62	0.97							
12	0.73	0.64	0.90	-0.59	-0.33	-0.53	-0.40	-0.39	0.25	-0.48	-0.31						
13	-0.83	0.02	-0.38	0.19	-0.03	0.41	0.20	-0.05	0.19	0.33	0.13	-0.52					
14	-0.29	-0.17	0.43	-0.55	0.56	-0.29	0.06	-0.47	-0.50	0.53	0.60	0.19	0.32				
15	0.51	-0.31	-0.12	0.32	0.44	0.06	0.24	0.50	-0.53	-0.09	0.08	0.05	-0.77	-0.27			
16	-0.25	-0.31	-0.36	0.06	-0.33	-0.01	-0.16	-0.03	0.36	0.09	-0.06	-0.47	0.05	-0.60	-0.22		
17	0.23	0.84	0.22	0.25	-0.41	0.35	0.13	0.26	0.48	-0.55	-0.53	0.48	0.14	0.01	-0.12	-0.61	
18	0.10	0.13	0.39	-0.69	-0.53	-0.65	-0.68	-0.74	0.44	-0.12	-0.16	0.24	-0.03	-0.09	-0.55	0.6	-0.38
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1. Duration of lucid-dream.
2. Pre-lucidity latency in that REMP.
3. Time of lucid-dream.
4. Length of pre-signal REM burst.
5. Mean REM amount, before lucidity.
6. Ditto, in lucid-dream.
7. Heart-rate, before lucidity.
8. Ditto, in lucid-dream.
9. Disturbances in lucidity.
10. Lights-out time.
11. Sleep onset time.
12. Total sleep time.
13. % Stage 4.
14. % Stage 3.
15. % Stage 2.
16. % Stage 1.
17. % Stage REM.
18. % Stage Awake.

FIGURE VIII.19 CORRELATIONAL MATRIX. (Based on 6 lucid-dreams. Subject: A.W.)

CHAPTER IX

THE 1st A.W. STUDY – PSYCHOLOGICAL FINDINGS

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IX.4 CONCLUSIONS.. 207

***

CHAPTER IX

IX.1 INTRODUCTION:

Apart from establishing the basic physiological parameters of the S's lucid-dreams, the 1st A.W. study also afforded an opportunity of obtaining some psychological information about these remarkable dreams. Experiments would not, at this stage, extend to, say, external sensory stimulation of the S in a lucid-dream, so as not to affect the physiological data (e.g. duration). However, certain important facts could be discovered about lucid-dreams by relating the dream-account to any signaled events. The main advantage of the signaling method is that specific dream events can be precisely pinpointed in the polygraphic record. That is not the case with ordinary dreams.

Some major questions about lucid-dreams, and dreams generally, which could perhaps be answered in this study are:

1/ Are dreams brief constructions, or is there temporal similarity with the real world?

The popular idea has existed ever since Maury's 'execution' dream that dreams are in fact pre-planned fantasies which are experienced very briefly (Maury,1853). The evidence against this concept has come from external stimulation experiments where the time interval between various incorporated stimuli (in the dream report) has been found to be close to the actual intervals between stimuli (Dement & Wolpert,1957a). However, it might be argued that the stimuli were 'stored up' and a compressed dream occurred on waking. It would be better for a S to signal various activities in the dream and see how this relates to the waking account.

2/ Is the S lucid throughout the lucid-dream?

The view could be propounded that the S becomes lucid briefly to signal, than rapidly lapses into ordinary dream consciousness. If the S could signal information continually throughout the lucid-dream, that would argue forcibly against such a view.

3/ Does the temporal order of events in the dream as reported on waking correspond with the order of the signaled data?

We do not know whether the events in dreams actually occur in the order in which we remember them. Indeed, some writers have opined that the order of events is manipulated on waking so as to become more comprehensible for reporting. This is the concept of secondary revision (Ellis, 1899; Freud, 1900, 1961). A comparison of different signaled data and the waking account should settle this important problem.

1/ Does the S have access to recent memories in the lucid-dream?

It is of interest to compare the lucid-dream state to waking consciousness, as any differences could have a profound effect on theoretical models. The question of recent memories - a major psychological characteristic - is therefore relevant. If the S can, in the lucid-dream, recall instructions given before sleep, this would indicate that memory traces are intact.

METHOD: (See previous Chapter, VIII.2).

IX.2 RESULTS:

LUCID-DREAM: A (Polygraphic record on page 171)

A. General.

The S went to bed at approximately midnight. A fault in the Mingograf EEG machine prevented continuous electro-physiological recording until 1.45 a.m. The S was woken after each of the later REM periods and asked for a brief dream report. This was to establish a psychological 'set' of thoughts about the experimental situation in the hope that this would encourage the initiation of lucidity.

B. Dream accounts and lucid-dream information:

5 a.m. ORDINARY-DREAM report.

The dreamer was in Africa, with a male and a female. The girl had belonged to the male, but was now with the dreamer. They were at a border post. The guards had shot someone. The dreamer felt uneasy.

6.30 a.m. ORDINARY-DREAM report.

A man and woman again. The woman took over from the Experimenter at the EEG machine. The dreamer thought this odd. He told her to clear off. She came upstairs to the dreamer's bedroom. She said she was looking for an Indian. The Experimenter came up to the bedroom and was concerned that the woman was talking to the S. The dreamer stated that the time was 7 a.m. He then woke up.

8.10 a.m. **LUCID-DREAM REPORT**:

The dreamer was walking around the University with electrodes on. He suddenly thought, 'I'm dreaming'. He immediately signaled 7 eye-movements. In the dream a girl was seen. The Experimenter was trying to kiss her, saying, 'Would you consider it a pleasure......?' Apart from the initial lucidity signals the S also reported making several sequences of eye-movements.

Actual sets of ocular-movements	Those reported on waking
7	7
12	-
7	10
4	10
4	4
4	4
4	4
4	4
4	4

The ocular signals in the EOG record were judged separately by both the Experimenter and a naive assistant. Both agreed on all signals.

C. Comments:

This was the first recorded lucid-dream in which ocular signals marked the point of lucidity. The dreamer was mainly concerned with signaling information in this lucid-dream. The ongoing dream was largely ignored.

D. Observations:

1/ TEMPORAL ORDER OF DREAM EVENTS IN THE WAKING ACCOUNT.

The electro-physiological record shows that the S performed 9 separate sets of ocular movements in the lucid-dream. This does not correspond precisely to the S's waking account, however, limitations of short-term memory capacity* could account for the discrepancies. Certainly, the last sets of ocular activity were correctly reported, indicating the operation of a typical recency effect in dream memory, as occurs in waking memory. This is of interest for dream theories generally, as it seems to indicate that the temporal order of events is as reported, especially the final events before waking.

* Miller, 1956.

2/ TIME-ESTIMATION IN THE LUCID DREAM.

The actual duration of the period of lucidity was 120 seconds (from signals to waking). The S's estimate of 2 to 3 minutes indicates that a sense of time operates in dreams, as in waking experience.

3/ ABILITY TO THINK COHERENTLY IN THE LUCID-DREAM.

The fact that the S could ignore the dream-scenery and concentrate on signaling points to an autonomy of Self in the lucid-dream. In addition, the definite sequences of different types of ocular-signals indicates coherency of thought.

4/ INITIATION OF LUCIDITY.

The incorporation of the experimental situation (wearing electrodes) into the S's dream appears to have helped initiate lucidity.

LUCID-DREAM: B (Polygraphic record on page 172)

A. General:

The S was in bed by midnight. Sleep-onset was at 00.45 a.m. The lucid-dream occurred at 5.18 a.m.

B. Purpose:

The S's task this night1was to attempt to signal by any other means than the ocular movements(which were also to be performed. Specifically, he was to concentrate on pressing the micro-switch hard, (it was taped to the S's hand, as on each night in the sleep-laboratory). Additionally, the S was to shout aloud (in the dream) to establish whether any sound was audible over the intercom system. and whether any increase in EMG amplitude resulted. The initial ocular signals were to be 4 left-right movements performed twice, separated by a short pause.

C. Lucid-dream information:

Realisation that the S was in a dream occurred suddenly whilst he was in a garden scene. The S signaled 4 + 4 eye-movements as planned. On waking he reported having pressed the micro-switch and shouted loudly and clearly. He was convinced the Experimenter must have heard. However in fact no sound at all was heard and there was no increase in EMG level. Neither did the event-marker pen operate, although it was found to be functioning perfectly on test. Only the ocular signals were communicated from the dream.

D. A false-awakening:

The S dreamed he had woken from the lucid-dream and was calling the Experimenter. However, the sleep-lab was now very large. The S was frightened. He then really woke up and called out again.

E. Observations:

1/ INABILITY TO SIGNAL BY OTHER MEANS THAN OCULAR MOVEMENTS.

The efficacy of eye-movement communication was again demonstrated, but apparently, muscular atonia of other parts of the body thwarts other forms of signaling - although the S may dream of making physical movements.

LUCID-DREAM: C (Polygraphic record on page 173)

A.General.

The S went to bed late, at 1.45 a.m. He was woken for a dream report at 5.15 a.m. A lucid-dream was reported spontaneously, at 6.30 a.m.

B. Purpose.

The author and S were running 2 para-psychological experiments at the time (Hearne & Worsley, 1977, Hearne, 1977). It occurred to the author that a simple pilot attempt at telepathy could be conducted whilst the S was in the lucid-dream state. The author selected a 4-digit sequence by blind entry to random number tables, when the S was sleeping. Low numbers were selected (1 to 5) to reduce the amount of signaling required in order that the dream should not be interfered with to any great extent. On observing the lucidity signals, the E would look at the sequence of numbers and concentrate on them. The S would signal (by left-right ocular movements) any numbers he saw in the lucid-dream. The probability of obtaining the same sequence as the E would be (5)^4 to 1 against chance. (Number: 2444).

C. Dream account and lucid-dream information:

5.15 a.m. ORDINARY-DREAM report.

The S was dreaming of being in the Psychology Department. People were coming in - students and staff. He was in a large corridor or hall. He followed the EEG lead thinking he could disconnect himself, but it went through a hole in the wall. He had to tell someone to inform the E.

6.30 a.m. **LUCID-DREAM REPORT**:

(The S could not recall the exact dream setting when he woke). He recalled signaling the initial eye-movements when he realised he was dreaming. He remembered seeing pebbles and wood with great clarity. He noticed that the wood-grain had a pattern which altered as he moved the wood. The S also saw a 3-figure number stamped on something. It was, perhaps, 156. The S thought he had just signaled the last number when he woke.

B.Comments:

The Polygraphic record reveals that shortly after the initial eye-signals, the numbers 1 and 5 (or 6) were communicated. The S did not wake shortly after signaling a number as he stated in his dream report.

There was relatively little REM in this lucid-dream. Also, it was not as vivid or coherent as is usually the case.

E. Observation:

1/ TEMPORPAL ANOMALY OF DREAM EVENT.

The fact that the S did not signal when waking, or just before, indicates that some temporal anomaly occurred in this lucid-dream. Also, only 2 of the reported digits appear to have been transmitted.

2/ FAILURE OF ‘TELEPATHY’ IN LUCID-DREAM.

The Subject’s inability to observe suitable 4-digit numbers in the dream rather confounded this experiment, however no signaled number-sequence corresponded to the target sequence. Nevertheless, it was decided to attempt this method again.

LUCID-DREAM: D (Polygraphic record on page 174;
Whole account on pages 377-379)

A. General:

The S retired to bed 15 minutes after midnight. He was woken after 2 REM periods and asked to give dream-reports. A lucid-dream was spontaneously reported at 7.45 a.m.

B. Purpose:

The plan here was to repeat the previous task of signaling any numbers the S saw in the lucid-dream (These might be house-numbers, for instance). The author again selected a random sequence of 4 digits (1 - 5), whilst the S slept (3352).

C. Dream accounts and lucid-dream information:

3.20 a.m. ORDINARY-DREAM report.

The S was having a dream about a field.

6.00 a.m. ORDINARY-DREAM report.

There was 'some dream about "Kojak."'

7.45 a.m. **LUCID-DREAM REPORT**:

The S dreamed about a film-star who was marooned on an island. The S became lucid when looking at the sand and noticing small plastic discs and thinking 'That's a funny thing to see there'. A scene-shift occurred and he was among suburban houses, where he saw numbers on gates. It ran into a seaside scene. He reflected that the lucid-dream seemed fairly long. In another scene there was a 'sunken vineyard'. In another scene, a car was observed turning a sharp corner. The numbers signaled were on gates, but some were higher up, from awnings. The S started signaling shortly after the initial lucidity signals, but he was not sure of the number. He thought it might have been 223. He tried to transmit about 6 number sequences consisting of: 1 or 2 4-digit numbers, 3 or 4 3-figure numbers.

However these latter numbers were aborted as the S noticed that they contained a zero or a number greater than 5.

D. Comments:

The Polygraphic record shows that shortly after the initial signals, a number which might be 253 was communicated. No other number-signals can be discerned, although if they were aborted after say only one or two eye-movements, they would not be obvious.

E. Observations:

1/ MANIPULATION OF LUCID-DREAM CONTENT BY PRE-PLANNING.

On attaining lucidity the scene changed automatically to a suburban street where many house numbers were apparent. This scene had been suggested in instructions to the S before sleep. The memory of this plan must have been clearly fixed and available in the S's mind at that point in the lucid-dream.

2/ NON-CONCURRENCE BETWEEN SIGNALS REPORTED AND OBSERVED.

Either the S had an illusion that he started to signal some numbers, or he did begin to, but they were abandoned early (after only 1 or 2 eye-movements) so that they could not be distinguished from ordinary REM activity.

3/ FURTHER FAILURE OF TELEPATHY' IN LUCIID-DREAM.

The signaled and target numbers did not correspond.

LUCID-DREAM: E (Polygraphic record on page 175;
Whole account. on pages 380-382)

A. General.

The subject was in bed at half-midnight. He was not woken during the night, and a lucid-dream was reported spontaneously at 5.30 a.m.

B. Purpose.

The subject was not given specific tasks this night. After signaling lucidity he could perform any tests or activities he considered appropriate.

C. Lucid-dream information.

5.30 a.m. **LUCID-DREAM REPORT**.

Before lucidity the subject was walking along a path against a high wind. He conjured up a motor-cycle to assist him. He then found himself in a crowded building and became lucid. He wanted to get out in order to fly, but there was a wire grille in the way. He tore it away as a 'bionic' person might, knowing he could do so in a lucid-dream. The Subject flew straight up for 10 feet, gave 3 eye-signals and came down. He was also giving a running commentary. A leaf was observed, like a thistle. The Subject tasted it, finding it sweet and sappy. Near the end of the dream he was inside a very dirty barn-like place, some 12 feet wide and quite long.

D. Comments.

The air-conditioning in the sleep-lab was rather noisy. After this night the noise level was greatly attenuated.

E. Observations.

1/ CONFIRMATION OF 3 EYE-SIGNALS LINKED WITH FLYING.

The subject's report of 3 distinct eye-signals when flying appears correct from the polygraphic chart.

2/ POSSIBLE INCORPORATION OF EXTERNAL STIMULI INTO THE LUCID-DREAM.

The noisy air-conditioning system could conceivably have influenced the Subject’s dreams, hence the ‘high wind’. Also, the restraining ‘wire grille’ might have been a symbolic reference to the electrode-wires above the Subject’s head. In this case the stimulus may not have been so much tactile, but rather a strong memory trace. (The Subject has always to remember that he is ‘wired-up’ and cannot for instance suddenly leap out of bed).

LUCIDDREAM: F (Polygraphic record on page 176; Whole account on page 199).

A. General:

Lights-out was at 15 minutes after midnight on this night. The lucid-dream occurred, rather unusually, in the first REMP at approximately 2.30 a.m.

B. Purpose:

The Subject was instructed to signal before and after flying so as to mark a sample of EEG for that activity. In addition, the Experimenter was to say aloud some random numbers over the intercom system to see if they appeared to be heard from within the dream.

C. Dream account:

2.40 a.m. **LUCID-DREAM REPORT**. (See report on page 199).

D. Comments:

Polygraphically, the record shows the normal 8 initial ocular signals appearing after a REM burst. Two other sets of REMs occur (of 4 eye-movements). No micro-switch signals are seen in the event-marker channel although the system was found to be operating later on.

E. Observations:

1/ FURTHER INABILITY TO OPERATE MICRO-SWITCH.

The subject reported clenching his hand in the dream and feeling ‘keys’ there. Had this action really been carried out the marker pen would have indicated this.

2/ POSSIBLE RECEPTION OF EXTERNAL AUDITORY STIMULI IN FALSE-AWAKENING STATE.

Unfortunately, the actual place in the polygraphic record, where the numbers were spoken, was not marked. They were uttered before the Subject roused from Stage REM (in a false-awakening). It is interesting that the subject thought he was speaking them.

Account of lucid-dream.

Subject: A.W. **LUCID-DREAM: F** Time: 2.30 a.m.

It was at night and I was in the van. I got out to see the shortest way going up a lane near Northwich. I had seen a ‘Castle’ signpost, but my geography was not right. Walking back to the van I saw a woman going by. I was having sexual thoughts about her. I got in the van and it changed into a bike. I was now lucid, and I made the eye-signals whilst riding the bike. I thought I’d better get off it , so I did. I jumped off and it sailed into a hedge. I clenched my fist to operate the micro-switch. I felt some keys in my hand. I was intending to fly but by this time the scene was fading. I was in the dark and tried to take-off, but it was no good. The sigaling there was ragged. I did 4 signals then stopped then did the last 4.

I then had a false-awakening. I was lying down but thought I had a breathing sensation. I thought I was counting. I heard 2 or 3 numbers: 3, 4, 2.
I then woke and heard you (E) saying numbers. (Actual number: 7, 4, 3, 2)

LUCID-DREAM: G (Polygraphic record on page 176)

Whole account on pages 383-384)

A. General:

The subject went to bed at 1.25 a.m. He was not woken in the nights A lucid-dream occurred and was reported by the Subject at 9.30 a.m.

B. Purpose:

In order to obtain a natural lucid-dream the Subject was given no specific tasks in the lucid-dream apart from signaling at the start of lucidity..

C. Lucid-dream information:

9.30 a.m. **LUCID-DREAM REPORT**:

The dream-scene at lucidity was a shaded garden. The Subject recalled thinking in the lucid-dream that he was lucid at last (after several unsuccessful nights in the sleep-lab). He decided to fly, after signaling 6 eye-movements. He rose a few feet and flew along about 10 to 15 feet, then down again.

The garden consisted mainly of trees and grass although there was some sort of building with very high windows. Someone was in the building and the Subject thought he was being observed. The subject concentrated particularly on attempting to press the micro-switch before flying. After that activity he could not think of any other suitable experiments to perform so he woke himself up.

D. Comments.

The subject reported that lucidity was attained after drifting in and out of dreams, This ties up with the polygraphic record which shows: a Stage I and Stage REM mixture The lucid-dream however, was firmly established in Stage REM.

E. Observations.

1/ CONFIRMATION OF FLYING-SIGNALS REPORT.

The Polygraphic record shows that the Subject gave the initial lucidity signals, then some 15 seconds later 5 other signals. This corresponds with the Subject's account of signaling before flying.

2/ POSSIBLE SYMBOLIC REFERENCE TO E.

The reference in the dream report to an observer behind a window might symbolically allude to the presence of the Experimenter who was situated in the next room behind a 2 - way mirror.

LUCID-DREAM: F (Polygraphic record on page 177; Whole account on page 205)

A. General:

On this occasion the Subject retired relatively early, at 11 p.m.

B. Purpose:

The micro-switch was attached to the Subject's left hand this time in case the preferred hand was for some reason more inhibited during sleep (The Subject is right-handed).

A water-spray (i.e. from a hypodermic syringe) was used to stimulate the Subject in an attempt to induce lucidity (See Chapter XII). The lucid-dream reported here however, did not occur in a REMP during which water-stimulation was present.

C. Dream account:

7.30 a.m. **LUCID-DREAM REPORT**: (See report on page 205).

D. Comments:

The record reveals that an initial set of 9 eye-signals was followed by little ocular activity for some 2 minutes until a major REM burst. A fresh set of 8 ocular movements was then followed some 12 seconds later by a further 5. This second part of the dream showed more REMs.

E. Observations:

1/ INABILITY OF SUBJECT TO PRESS SWITCH IN NON-PRERERRED HAND.

The Subject distinctly recalled pressing the switch and 'felt it depress', however, no such action really took place.

(On later test the micro-switch operated).

2/ REPORTED LOSS OF LUCIDITY FOLLOWED BY RECOVERY.

After the initial signals, lucidity was lost. The subject's reported 2 signals after flying cannot be distinguished in the record. It might be that they are submerged in the REM burst preceding the 2nd set of 8 ocular movements. The loss of lucidity could be related to the rather diffuse pre-lucid REM burst. Possibly, cortical stimulation was insufficient to maintain the state.

3/ EEG RECORD OF FLYING.

The S was able to signal before and after flying, although he was 'losing control' of it towards the end. The reported 8 and 5 eye-movements correspond with the polygraphic evidence. The EEG of this 'typical' dream activity appears to consist of distinctly slower saw-toothed waves than much of the rest of the record.

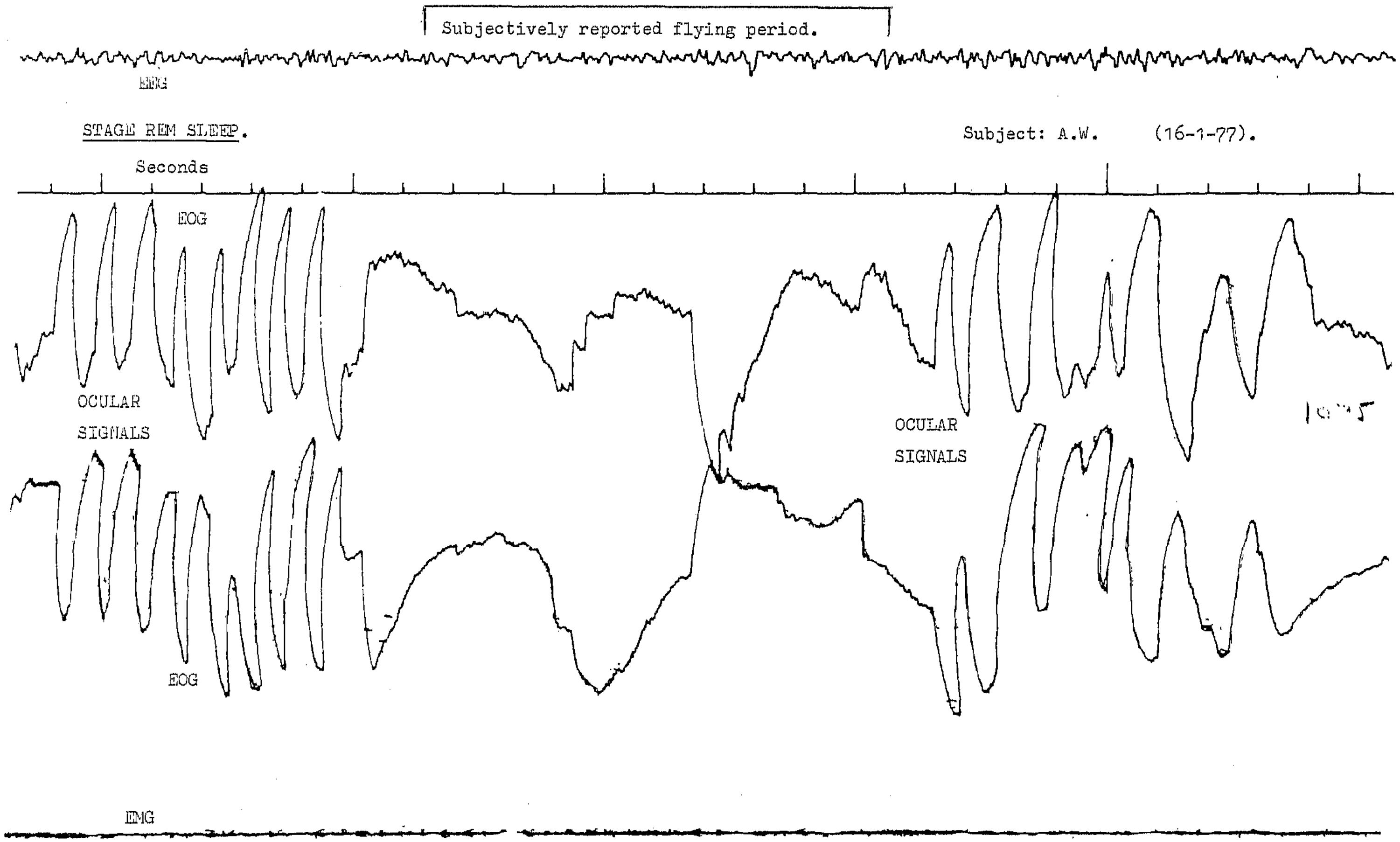

FIGURE IX.1 POLYGRAPHIC RECORD OF FLYING IN LUCID-DREAM

Account of lucid-dream transcribed from tape.

Subject: A.W. **LUCID-DREAM: H** Time: 7.30 a.m.

There were 2 lucid-dreams - together. I remember pressing the button which was in my left hand about 3 times and I thought I could feel it when I did it. In the dream I signaled and flew but then I couldn't fly very well and I signaled 2 to mark the end of this attempt.

I can't recall exactly how I became lucid at first. It seemed as if I was having strong imagery but I suspect now it was in fact a dream. I think in the second lucid part I signaled 8 and flew and then 5 but I couldn't go on any longer because I was losing control of it. But I think I did control the dream. I seemed to be maybe at some children's swimming pool and I was flying over that - but it wasn't entirely artificial - there were rocks in it and I think I came down on one of these rocks but not knowing whether I could continue to fly or whether I was stuck on this small rock and then I sat down in this chair and one of the children came and plonked himself on my knee which was unfortunate because somehow or other I'd got a drawing pin stuck on my leg and when he did that he knocked it right in. But the effect was painful and it seemed to produce an injury out of all proportion to the size of the thing. The muscle underneath the skin started sprouting out. This suggests that I continued to dream when I thought I was awake, but I was not really lucid then. It seemed to be sunny I think in the first part. I started off near the water and made the first signals and then flew over the water - it could have been a beach. It was all rather non-descript but not non-sensical. I did the flying deliberately.

IX.3 DISCUSSION.

It has been clearly demonstrated in this Subject that subjectively reported dream activities, deliberately marked at the time by ocular signals, show great accord with polygraphic evidence obtained from unambiguous Stage REM sleep.

The results suggest that lucid-dreams may have natural temporal properties (i.e. they are not brief phenomena) and that the Subject is aware of the passage of time. The reported order of dream events generally concurs with the signaled information, so any effect of 'secondary revision' would seem to be minimal.

As well as autonomy of Self, coherent thought would appear to be present, as in the dream the Subject acts on instructions given a few hours before. Recent memories must therefore be available - they are not 'shunted out' for modification or consolidation at that stage (IV.7). Occasional differences between reported information and observed data are found, but these could be explained by the normal limitations in short term memory capacity.

The evidence suggests too that lucidity is usually present throughout the dream, since signals can be made continually. When lucidity is temporarily lost, the Subject is aware of that.

Possible symbolic references to the experimental situation could be construed from the dream reports. The 'wires' above the Subject which might entangle him (electrode wires?) and the 'observer' behind the window (Experimenter behind the 2-way mirror) are examples. The various micro-switch and 'running commentary experiments indicate that the ocular-movement method of signaling appears to be the only way of communicating to the external world from the lucid-dream state*.

This author considers that the example of a 'flying'

(*A further method was later discovered. See Chapter XIII).

EEG is perhaps of some importance for future dream research.

Superficially, the EEG appears to be singular. It is conceivable that when enough specific lucid-dream activities have been so recorded it may be possible to identify dream activities by on-line analysis of the EEG. This might apply to both ordinary and lucid-dreams.

The dreams in this Study were relatively natural examples (in that, say, external stimulation was not applied),although the sleep-laboratory is always an alien place to subjects and can affect dream content (Dement et al., 1965). Therefore, the results may be slightly atypical from that point of view. It should be noted too that the ocular signaling represents a departure from normal lucid-dream behaviour. Regarding experimentation within the lucid-dreams, the Subject frequently sets himself such tests to perform in lucid-dreams at home, so that aspect is not so unusual to him.

IX.4 CONCLUSIONS.

The results from this Subject indicated that:

1. The temporal order of signaled information in lucid-dreams largely corresponds to that reported on waking. Some temporal anomalies occur occasionally.
2. Time-estimation of the duration of lucidity is fairly good.
3. Coherent thought is possible in lucid-dreams.
4. External stimulation may be incorporated into lucid-dreams.

5. The Subject was apparently unable to signal from the lucid-dream by pressing a micro-switch.
6. In the brief experiments performed, a telepathic ability was demonstrably not a feature of lucid-dreams.
7. Pre-planning apparently automatically set the lucid-dream scene.
8. External stimulation may have been incorporated into a false-awakening.
9. Possible symbolic references to the experimental situation were noticed in some lucid-dream reports.
10. Lucidity was present throughout the lucid-dreams, but was lost on one occasion, to reappear a little later.
11. Recent waking memories are available in lucid-dreams.

This study, comparing information supplied from within the dream and afterwards on waking, has therefore provided novel evidence on some basic problems of dreams, as well as illuminating aspects of the lucid-dream itself.

******

Having described the electrophysiological and psychological data from a major study of one Subject, the next Chapter chronicles attempts to find other lucid-dream subjects and the results obtained.

CHAPTER X

OTHER LUCID-DREAM SUBJECTS

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CHAPTER X

OTHER LUCID-DREAM SUBJECTS.

X.1 INTRODUCTION.

The 1st A.W. study yielded previously unknown information concerning lucid-dreams, but was limited to that one Subject. In order to generalise the findings, further Subjects needed to be studied. Therefore, advertisements were placed around the University for persons who have frequent lucid-dreams to take part in a sleep-lab study. The response was very poor, so the Experimenter canvassed students in an effort to find suitable Subjects.

X.2 METHOD.

Seventeen Subjects (13 females, 4 males) took part in this study. Ten (8 females, 2 males) young adult students were found by canvassing. A further 7 Subjects (5 females, 2 males) were obtained via friends (see Table X.1, next page. Unfortunately, funds were not available for paying Subjects and only 2 Subjects were willing to spend more than 1 night in the sleep-laboratory.

Subjects were wired-up using the usual electrode arrangement (page 140). In addition, a micro-switch* was taped to one hand. The Subject was allowed to sleep undisturbed in the hope of monitoring a spontaneous lucid-dream. Instructions to subjects:

'If you should at any time tonight when you are dreaming become aware that you are dreaming, I want you to move your eyes from left to right 6 times and press the micro-switch'.

The responses were practised several times before sleep.

(* See page 139).

TABLE X.1

SUBJECTS:

Subject	Sex	Age	Reported frequency of lucid-dreams.
A	M	19	2 per week
B	F	?	0.5
C	F	20	7
D	M	22	2
E	M	?	1
F	F	27	1
G	F	?	1
H	F	23	2
I	F	19	2
J	F	20	2
K	F	21	0.5
L	F	18	2
M	F	18	1
N	F	20	1
O	F	20	2
P	F	25	3
Q	M	24	2

Mean reported frequency: 1.9 per week.

X.3 RESULTS.

Only one of the 17 subjects reported a lucid-dream when wired-up in the sleep-laboratory. Eight subjects reported that between the original canvassing and the sleep-lab monitoring night, they had experienced lucid-dreams in which deliberate ocular movements were made. It had been suggested that they practise such movements in lucid-dreams at home.

Subject P (A.C.) produced ocular signals in the sleep-lab, however she reported that the realisation of dreaming usually comes with ‘surfacing’, and is only brief. Her results were thus: (This subject was not Linked to a micro-switch).

FIRST NIGHT: (The subject went to bed at 2.23 a.m.)

The Subject displayed ocular signals on 2 occasions, both at the immediate onset of Stage REM, shortly after the last k-complex of Stage 2 :

4.10 a.m. The subject dreamed of being awake. The experimenter was going over the eye-movement instructions with her. The Subject moved her eyes to practise, but she was not lucid (see page 213).

6.00 a.m. The Subject became aware of dreaming when standing in an empty swimming pool, so she signalled (see page 214).

COMMENTS:

On the first occasion (see Figure X.1 page 213) the ocular signals occur soon after the final k-complex of Stage 2 and they are followed by apparent Stage REM. It is difficult to decide which Stage the signals are in since, unfortunately, the EEG is distorted by mains interference. It seems likely though that they are in Stage REM.

On the second occasion (see Figure X.2, page 214) the EEG is still affected by 50 Hz artefact. Movement artefact is shown in the record soon after signalling starts. It is likely that the subject has in fact woken briefly at this point. Further disturbances occurred over the following minutes.

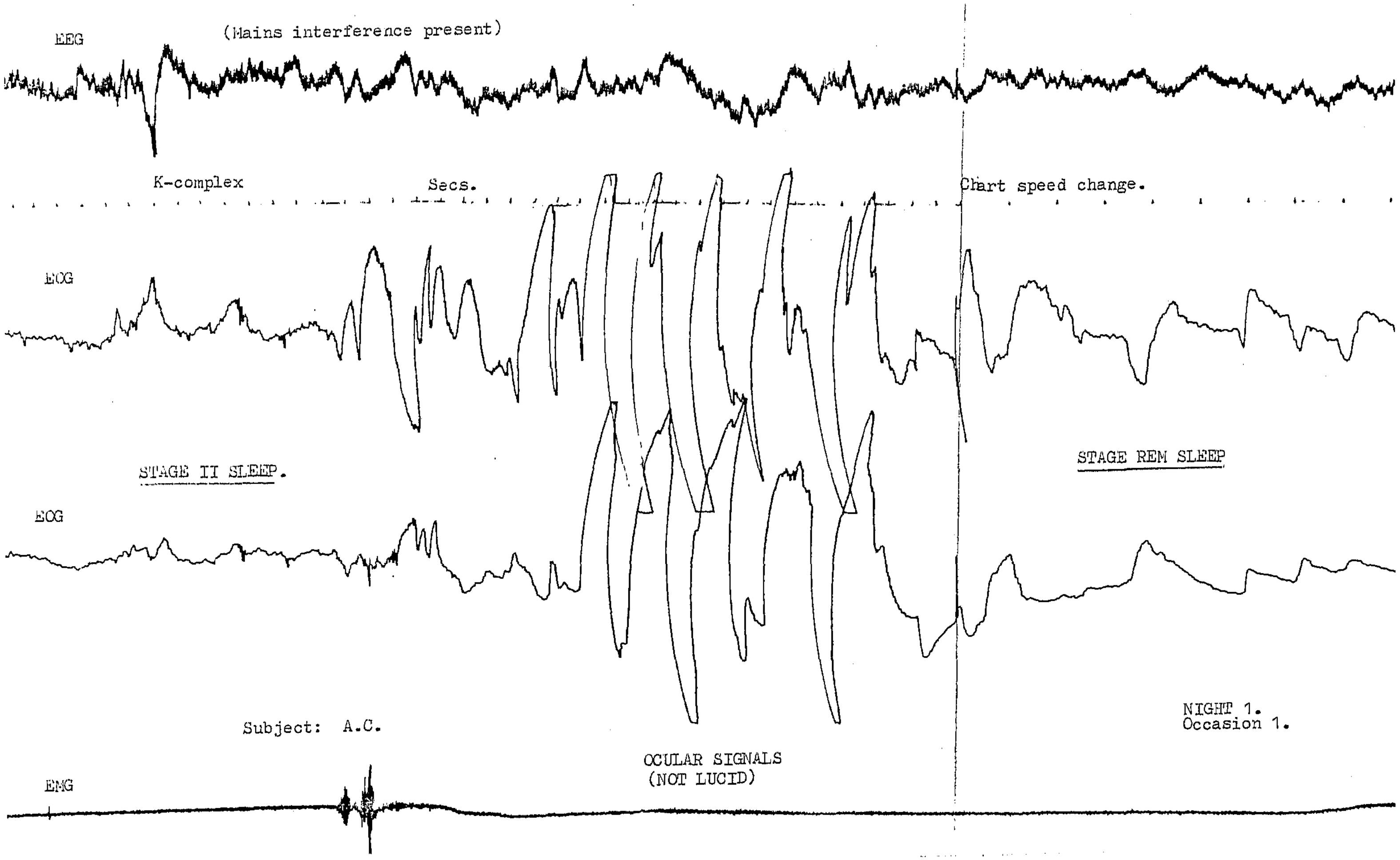

FIGURE X.1 **OCULAR SIGNALS** (Not lucid) Night 1, occasion 1.

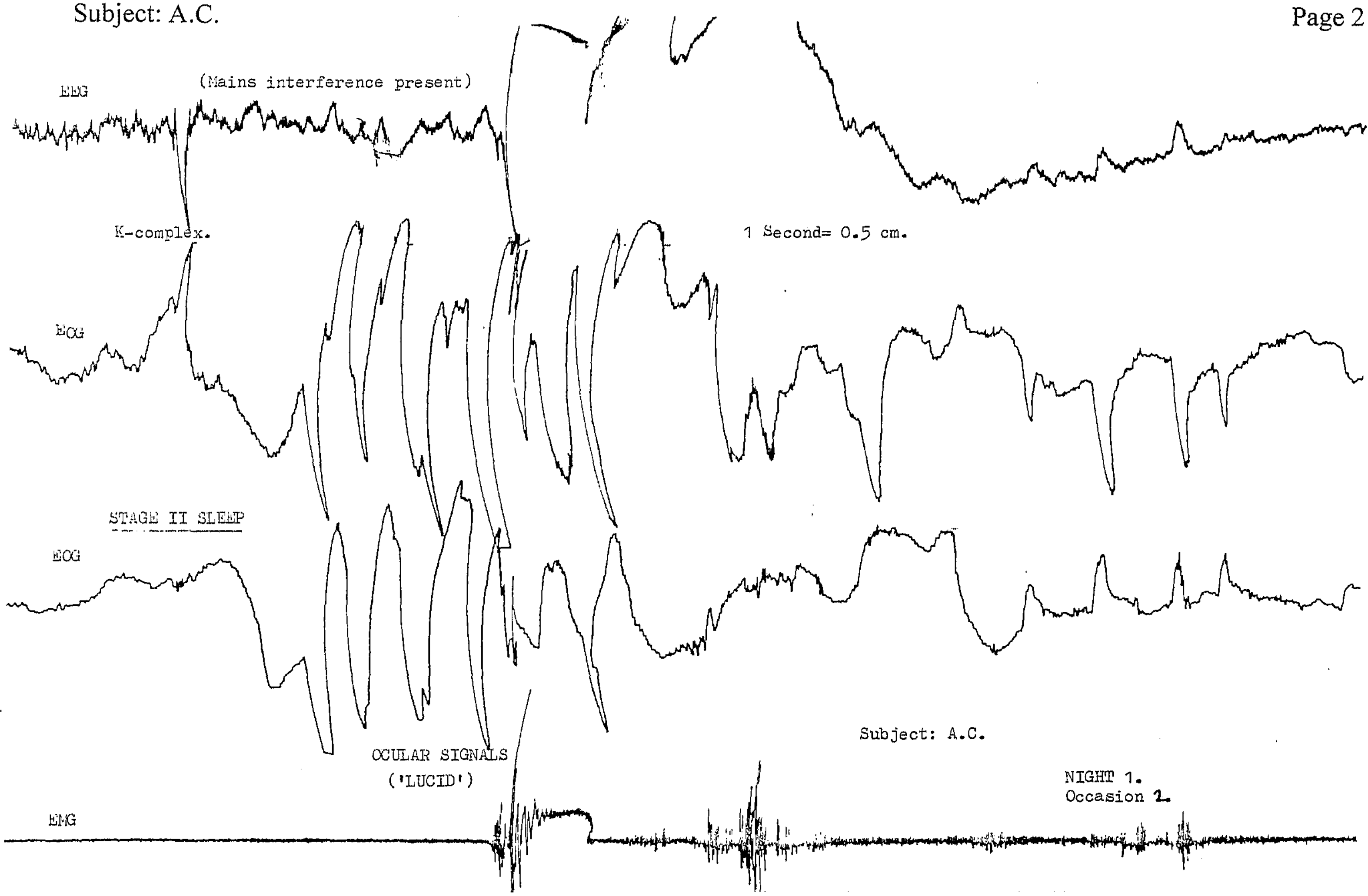

FIGURE X.2 **OCULAR SIGNALS** ('Lucid') Night 1, occasion 2.

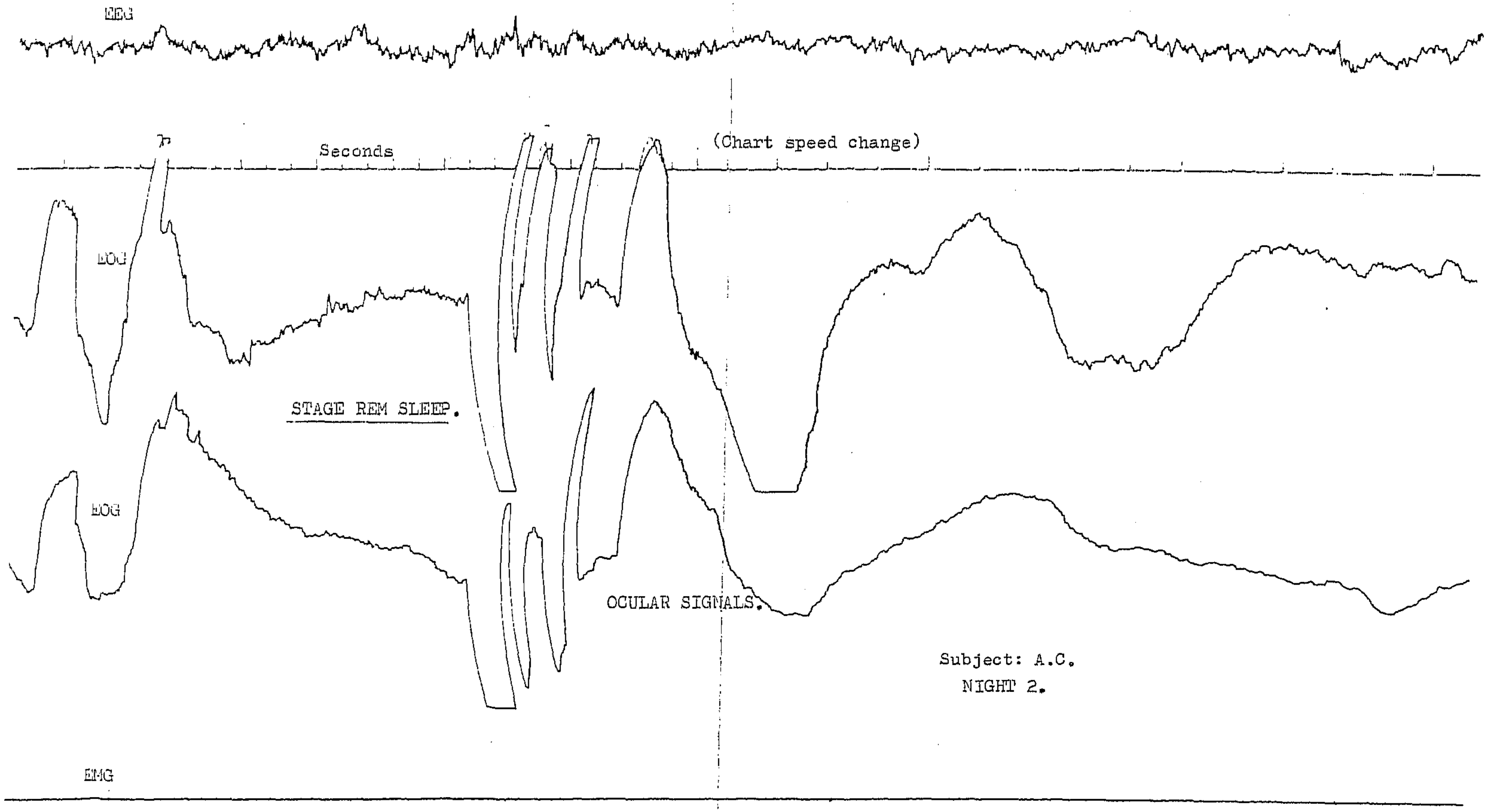

FIGURE X.3 (X.2 Continued) **OCULAR SIGNALS** ('Lucid') Night 1, occasion 1.

SECOND NIGHT: (The subject retired to bed at midnight).

3.10 a.m.: The subject reported a mundane dream of shopping when woken some 6 minutes after making 4 signals. She was looking at a rack with belts on it and suddenly became lucid. The signals were deliberate and occurred in stage REM sleep. They were produced 11 minutes after the start of that particular REMP (see Figure X.3, page 215) some 10 seconds after some REMs.
(The chart speed was increased after the signals).

This subject states that, in contrast to Subject A.W. and those surveyed in Chapter X, her lucid-dreams usually occur in the early or middle part of the sleep period.

X .4 DISCUSSION.

Taking the mean reported frequency of lucid-dreams for the subjects to be 2 per week, perhaps 5 (i.e. 2/7 x 17) should have experienced lucid-dreams in the sleep-laboratory. The discrepancy between expected and actual lucid-dreams may perhaps be explained by a first-night effect inhibiting their productions They are elusive in the sleep-laboratory. A similar dearth of nightmares has been found by investigators of these in the experimental environment (Feldman & Hersen,1967). The psychological effects of being studied during sleep are obviously potent. It is unfortunate that most subjects could only stay one night in the sleep-laboratory. In future work, subjects should have an adaptation night and be paid suitable remuneration as an incentive to return.

Most of Subject A.C.'s 'lucid dreams' are perhaps not true examples of the phenomenon, since she reports that lucidity is only brief and is often associated with surfacing. However, the 2nd night sample does appear to be from Stage REM sleep

Although 16/17 subjects did not produce lucid-dreams in the sleep-laboratory, of the 2 subjects who have to date (A.W., A.C.), both were able to produce ocular movements. Therefore, probably the technique is satisfactory, but lucid-dreams are rather scarce in the experimental setting.

Not enough data from the 2nd subject has been collected for any statistical comparisons with subject A.W. One unusual aspect of her 'lucid-dreams' is that they nearly always occur in the early or mid-sleep periods ; also, lucidity is brief. There is some doubt therefore whether they should be presented as examples of lucid-dreams along with those of subject A.W., whose lucid-dreams do conform to those typified in Chapter V.

X.5 CONCLUSIONS.

1. A first night effect appears to inhibit lucidity in the sleep-laboratory in subjects.

2. A further example of ocular signaling from Stage REM was obtained from a different Subject, thus indicating perhaps that it is a general ability.

3. It is not certain whether the 2nd Subject's lucid-dreams constitute typical examples of the phenomenon.

***

Having observed the problems involved in obtaining Lucid-dream Subjects, the next step planned was a study to establish whether simulating Control subjects could produce ocular signals and REM EEG.

CHAPTER XI

SIMULATING CONTROL EXPERIMENT

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CHAPTER XI

SIMULATING CONTROL EXPERIMENT.

XI.1 INTRODUCTION.

The waking EEG of humans consists of low-voltage (approximately 59μV measured from the scalp) mixed-frequency activity containing beta waves (13-30 Hz), alpha (8-13 Hz) and theta waves (4-8 Hz). REMs are present but are different from those of Stage REM sleep (Jacobs et al., 1971), and submental EMG shows high tonus from muscular tenseness in the chin region (Rechtschaffen & Kales, 1968). The EEG of Stage REM sleep contains slower waves (theta, 4-8Hz) with, in many Ss, 'saw-toothed' waves of about 3 Hz (Schwartz & Fischgold, 1960). There is a lack of alpha and beta activity. (To the skilled observer EEGs of the various sleep Stages are easily recognised). REMs, of course, occur in bursts and the EMG is very low, indicating profound muscular relaxation.

To what extent is it possible to fake these measures ?

1/ REMS could be faked by someone who knew they occur in bursts.

2/ EMG could conceivably be faked by a person who was extremely relaxed, say on waking from Stage REM sleep.

3/ So far as can be ascertained, there are no cases in the literature of a person being able to alter the EEG to that of REM when awake. Narcoleptics may collapse into a state of cataplexy and evince Stage REM, but this is in fact true Stage REM sleep (Hishikawa & Kaneko, 1965; Dement et al, 1966; Roth et al, 1969).

Nevertheless, perhaps a S who wakes in the night from REM sleep may be able to produce a REM-like EEG and EMG whilst deliberately moving their eyes as signals. To test this possibility an experiment would be conducted in which Ss would simulate signals on waking spontaneously during the night or on gentle rousing from Stage REM sleep.

***

XI.2 METHOD.

(a) Subjects:

There were 9 Ss (3 males, 6 females), all young adult undergraduate or postgraduate students at Liverpool University. Approximately half responded to an advertisement for Ss, the rest were obtained by canvassing.

(b) Apparatus

Sc were wired-up using the same electrode emplacements as in the 1st. A.W. study (Page 140).

(c) Instructions to Ss:

'Some people claim to have dreams in which they realise they are dreaming. At those times they also claim they can signal to the Experimenter by moving their eyes from left to right 8 times, and simultaneously pressing a button 8 times. However, it could be that they are really awake then. Your task is to produce the same behaviour by pretending or faking in any way you like, whenever you wake in the night. Sometimes you will be woken from dreaming by me saying 'signal' quietly. On hearing this, remain quite still for a few seconds, then signal. Do you understand?'

(d) Experimental procedure:

Ss spent one night in the sleep-laboratory to adapt to conditions, then the experiment was performed on the second night. The experiment covered 18 nights in all.

Instructions were read to Ss when they were in bed. Each S practised the two types of signal 2 or 3 times.

In 1 or 2 later REM periods, regardless of whether the S had previously signalled in the night, the S was gently roused from REM sleep by the E saying 'signal' in a quiet voice over the intercom system. If the S did not respond within 20 seconds, the word was repeated a little louder.

(e) Experimental design

The most REM-state like sample from each S would be given, with a randomly selected example of the lucid-dream S's signals, to naive judges. They would be provided with the basic scoring instructions for Stage REM sleep (Rechtchaffen & Kales, 1958), and asked to select out any sample(s) showing these characteristics. The binomial probability of selecting the real lucid-dream samples (i.e. from the 1st A.W. Study) would then be calculated.

XI.3 RESULTS:

(a) Evaluation of results:

A naive judge selected the most REM-state like signals from the few (1-3) samples of each of the 9 Ss.

The samples consisted of 30-second sections of polygraphic record Xeroxed onto A4 paper. The naive judge was given these instructions:

‘Select just one sample from those provided from each S, closest to the following criteria:

1/ The bottom line (EMG) must not increase in thickness at all, except for small (1/10 inch) fairly regular ‘blips’ (Heartbeat).

2/ The top-line (EEG) must not contain a group of regularly spaced waves that look like this:

The peak of these waves, when counted, would total about 8-10 per cm. Waves of wider spacing are O.K. (n.b. to count peaks, just count the top of each wave. Thus, this example has 5 peaks):

3/ The waves in the top-line must not change noticeably to a different form at any place’.

In fact, all the simulators were unaware of REM atonia, and pressed the micro-switch when signalling with their eyes, so making an obvious difference from the genuine lucid-dream records, therefore, the marker-channel was blotted out of the records.

Four different judges then attempted to differentiate any signals in Stage REM using the same instructions as above. The judges were naive concerning electro-physiological scoring techniques. The instructions were preceded by a preamble:

‘Your task is to pick out one of the samples of electro-physiological data which pass the following STRICT criteria:’

A note informed judges to disregard the computer-typing on some records. The lucid-dream sample had no special identifying marks. The samples were presented in a different random order for each of the 4 judges, to avoid any common preference-position effect.

The judges were simply handed the records, with the instructions, and left alone to make their decisions. Judgments were made individually, on separate occasions.

(b) Sample characteristics (See Appendix, pages 385-393)

The samples showed the following characteristics at the time of signalling:

SAMPLE 1: (S: L.M.) Waking EEG. Moderate-tonus EMG burst of slight
(See page 385) muscular activity. The micro-switch was pressed.
SAMPLE 2: (S: S.R.) Waking EEG with alpha present. Low-tonus EMG, but
(See page 386) showing moderate muscular activity at points.
The S pressed the micro-switch.
SAMPLE 3: (S: R.C.) Waking EEG, with alpha present. Moderate-tonus
(See page 387) EMG with some sporadic moderate muscular activity.
Switch operated.
SAMPLE 4: (S: P.S.) Waking EEG, with alpha. Moderate EMG with sporadic
(See page 388) moderate muscular activity. Switch operated.
SAMPLE 5: (S: N.L.) Change from REM EEG to waking, with alpha, on
(See page 389) signalling. EMG increases noticeably from low-
tonus to moderate tonus. Some movement artefact.
S pressed micro-switch.
SAMPLE 6: (5: G.S.) Waking EEG with low-voltage alpha. Low tonus EMG.
(See page 390) S pressed micro-switch.
SAMPLE 7: (S: L.M.) REM EEG changing to waking, with alpha, on
(See page 391) signalling. EMG remains low. S pressed switch.
SAMPLE 8: (8: S.C.) Waking EEG, with alpha. EMG shows long burst of
(See page 392) moderate muscular activity. S pressed switch.
SAMPLE 9: (5: P.F.) Waking EEG, with alpha. Noticeable increase in
(See page 393) EMG. S pressed micro-switch.
LUCID-DREAM SAMPLES:(S: A.W.): REM EEG, with saw-toothed waves.
(See pages 167-170 Low-tonus. S does not in fact press switch.

(c) Genuine samples:

For each of the four judges, a different sample of ocular-signals record from the lucid-dream S (A.W.) was supplied, in case a randomly-selected one happened to be more ‘REM-like’ than others. The records were from the Liverpool sleep-lab work, so that the format was the same as for the simulators’ records.

(d) Findings:

All four judges selected-out only one sample as fulfilling the stated criteria. In each case this was the signalling record of the lucid-dream S. Since the chance expectation of choosing this record is 1/10, the overall probability = (0.1)^4 i.e. P = 0.0001. Thus, the genuine record was selected-out from those of simulators at a very statistically-significant level.

XI.4 DISCUSSION:

The results of this experiment support the previously stated view that Ss cannot fake ocular-signalling from REM sleep. The evidence is particularly good since, apart from the fact that naive judges (using the ordinary criteria for defining REM sleep) could identify the genuine lucid-dream record, all the simulating Control Ss pressed the micro-switch, unaware of muscular atonia in real Stage REM.

***

Having satisfactorily answered the question of whether or not Subject A.W. was awake when signalling, the course of experimentation turned next to determining if lucid-dreams could be experimentally induced in the sleep-laboratory.

CHAPTER XII

LUCID-DREAM INDUCTION EXPERIMENTS

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CHAPTER XII

LUCID-DREAM INDUCTION EXPERIMENT.

XII.1 INTRODUCTION:

An obvious progression in the study of lucid-dreams is to attempt to initiate them in persons who do not experience the phenomenon, and to increase their frequency in those who do. This should provide not only more Ss, but a more efficient program for their investigation since lucid-dreams could be produced in the sleep-laboratory when required. The problem therefore presented itself of how to achieve this.

The author had noted that several 'lucid-dreamer' reported that specific percepts in dreams (e.g. the sight of a dead father, with one S) regularly appeared to cause conscious awareness within the dream. These specific 'lucidity generating-images' are powerful triggering agencies, however their frequency may be low.

The idea occurred of providing an external stimulus in REM sleep, so as to evoke a certain type of percept, which if previously linked to the concept of lucid-dreams should give rise to that state. It has been demonstrated that external stimuli are incorporated into lucid-dreams, and that a water-spray is particularly effective (Dement & Wolpert,1958). Indeed, in that paper some Ss reported having a realisation of dreaming at that point.

Therefore, it was decided to undertake a study, the purpose of which would be to attempt to initiate lucidity in a sleeping S in Stage REM, by means of a water-spray.

Subjects would be asked to produce ocular-signals if such realisation was present. It would be necessary to include a Control condition in the design, using a catch trial (when no stimulus was applied) in order to establish whether demand-chacteristics (Orne, 1962) were biasing the experimental situation. i.e. Subjects might feel obliged to report having become lucid on waking in order to comply with the Experimenter's desires and not wishing to make the lengthy proceedings seem fruitless.

XII.2 METHOD.

(a) Subjects.

Ten subjects (8 females, 2 males) were used in this experiment. They were all young adult University students, aged 19-27. All were unpaid volunteers obtained by canvassing or in response to an advertisement.

(b) Apparatus.

Subjects were wired-up using the same electrode emplacements as in previous experiments (See page 140).Water was sprayed from a Gillette 2 ml disposable hypodermic syringe using a size 17 needle.

(c) Experimental procedure.

Subjects had one adaptation-night in the sleep-laboratory (on which they were wired-up but not monitored) before being run on the second night, which was close to the first. After being wired-up, the Subject went to bed and was given instructions verbally.

E trials: In one of the later REMPs the Experimenter crept into the bedroom and sprayed a fine jet of water onto the Subject's face or hand, using the syringe, from a distance of approximately 12 inches.

C trials: In another of the later REMPs the Experimenter crept in, waited a short while, then with the syringe in band, woke the Subject without sprinkling the Subject.

In either condition, on waking the S was asked to report any dream event that had just been experienced, and whether the realisation of dreaming occurred to the S on stimulation.

One E and C trial was given, in random sequence (determined by random-number tables) to each S. Overall the two conditions were equally presented first. The S's comments were tape-recorded.

(c) Instructions to Ss:

'On 2 separate occasions tonight when you are dreaming, some water will be sprinkled lightly on your face. as a result, you may dream , say, that it is raining, or that a pipe has burst and has sprinkled you. What you have to remember is that if you dream of being sprayed in any way, it is a signal to you. You should then realise that what you are experiencing is a dream. You must then immediately signal back by making 6 left-right eye-movements, whilst simultaneously pressing the micro-switch 6 times. Try to maintain the insight that it is a dream and observe the dream carefully. A little later you will be woken and asked to give a full account of your dream'.

(n.b. The S practised the signals several times before sleep).

XII.3 RESULTS

Subject: A. Female (Sequence: E: C)

E: Dream of washing a baby and getting splashed.
C: Dream of attaching labels to objects.
No realisation of dreaming.

Subject: B. Female (Sequence: C:E)

C: No recall.

E: Dream of speaking to a friend who was inadvertently spitting at the Subject.

No realisation of dreaming.

Subject: C. Female (Sequence: E:C)

E: Dream of being on yacht, with spray on face.

C: No recall.

No realisation of dreaming.

Subject: D. Male (Sequence: E:C)

E: Dream of 'thinking of what to say'.

C: Dream of seeing trains at a station.

No realisation of dreaming.

Subject: E. Female (Sequence: C:E)

C: No recall.

E: Dream of taking an exam.

No realisation of dreaming.

Subject: F. Female (Sequence: C:E)

C: Dream of being in a big room, talking to a client.

E: Dream of watering plants in the sleep-lab. Water dripping from washing hanging above the bed.

No realisation of dreaming.

Subject: G. Female (Sequence: C:E)

C: Dream of standing outside a hospital.

E: Dream of standing on pavement with friends. Wiping feet on dewy grass.

No realisation of dreaming.

Subject: H. Male (Sequence: E:C)

E: Dream of black cat which the Experimenter had let into the Sleep-lab. The cat pee-ed on the Subject.

C: No recall.

No realisation of dreaming.

Subject: I. Female (Sequence: E:C)

E: Sexual dream.

C: Dream of unpleasant events, something to do with the weather.

No realisation of dreaming.

Subject: J. Female (Sequence: C:E)

C: Dream of being by the docks with the Experimenter, and going with him to a coffee-bar.

E: Dream of being in conversation with someone.

No realisation of dreaming.

***

Two independent judges instructed to decide whether or not a water-spray theme was present in the dream protocols had an inter-rater reliability of 100%. Both judges saw the theme in 6 of the 10 Experimental dream reports and not at all in the 10 Control dream reports.

XII.4 DISCUSSION.

It would seem that water was incorporated into several dreams, but it was not successful in producing lucidity.

The 60% incorporation rate is somewhat higher than the 42% rate found by Dement & Wolpert, (1958b). There were some procedural difficulties with the method in that the stimulus was rather variable each time as the position, direction and force of the spray differed. Problems also arose occasionally when the Subject's face was covered by the sheet or blankets.

Possibly the technique was not successful as a longer-term learning process has to occur. Perhaps the concept of lucidity needs to be firmly established in the long-term memory before the feel of a water-spray initiates that thought.

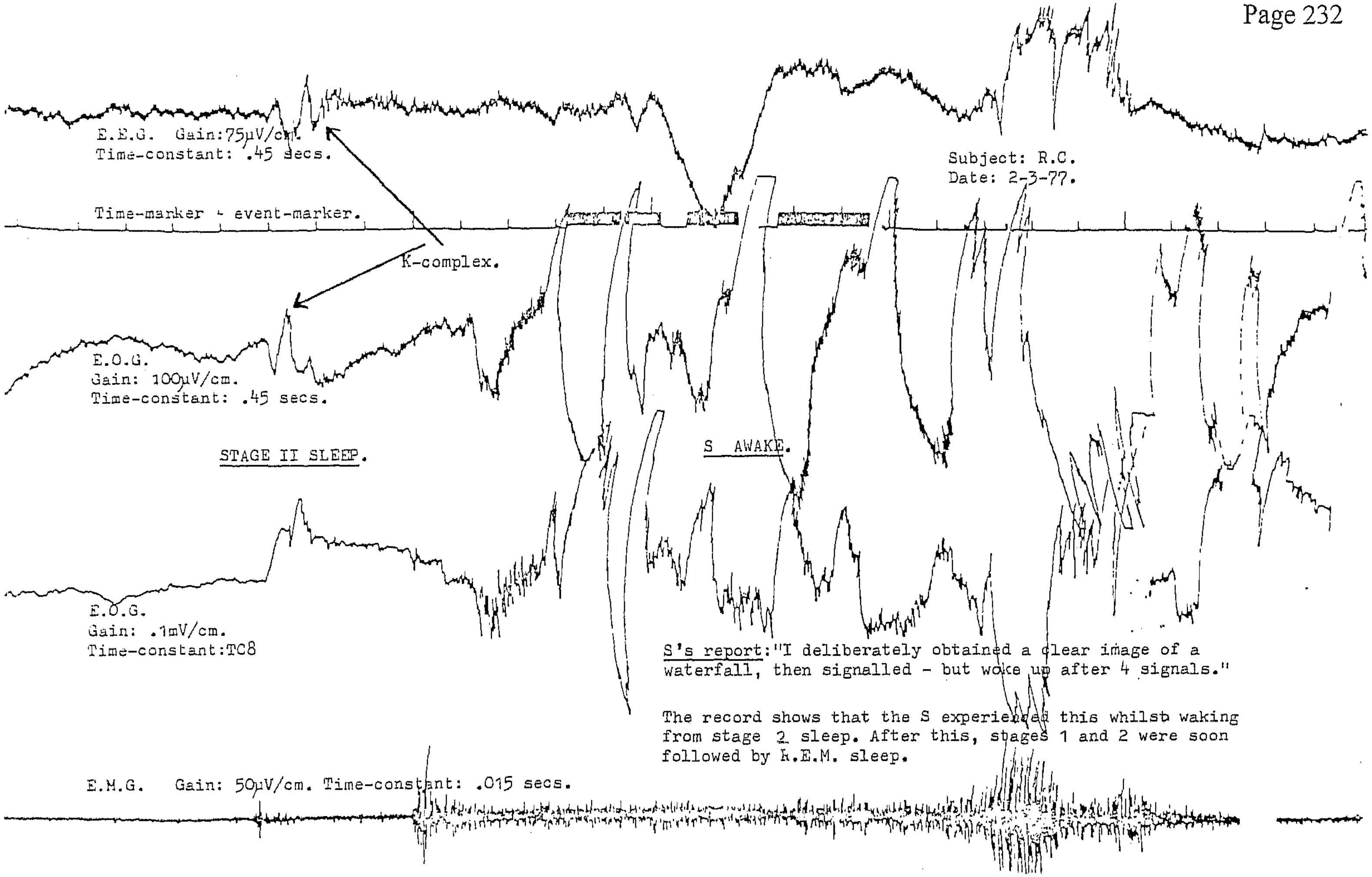
It is interesting that a Subject in a separate experiment (Wagstaff, Hearne & Jackson., 1978) reported that the sight of water in an ordinary dream did trigger lucidity. The Subject knew about the water stimulation experiment, and the association between water in the dream and memory of the experiment apparently initiated insight within the dream.

XII.5 CONCLUSIONS.

It was not found possible, at least for 1 night only, to trigger lucidity in ordinary Stage REM dreams by means of a water spray in persons previously 'set' to link water-stimulation with the concept of lucidity.

Subjects did not appear to comply with hypothetical 'demand-characteristics' in reporting dreams involving water when no stimulation was in fact applied.

n.b. Subject E reported at one point : 'I deliberately obtained a clear image of a waterfall, then signaled - but woke after 4 signals'. The polygraphic record shows that the Subject experienced this whilst waking from Stage 2 sleep, which was followed by Stages I and 2, then REM (see page 232).


E.E.G. Gain:75µV/cm.
Time-constant: .45 secs.
Subject: R.C.
Date: 2-3-77.
Time-marker + event-marker.
K-complex.
E.O.G.
Gain: 100µV/cm.
Time-constant: .45 secs.
STAGE II SLEEP.
S AWAKE.
E.O.G.
Gain: .1mV/cm.
Time-constant:TC8
E.M.G. Gain: 50µV/cm. Time-constant: .015 secs.

S's report: "I deliberately obtained a clear image of a waterfall, then signalled - but woke up after 4 signals."

The record shows that the S experienced this whilst waking from stage 2 sleep. After this, stages 1 and 2 were soon followed by R.E.M. sleep.

FIGURE XII.1 IMAGERY REPORT FROM SUBJECT ON WAKING

So far in this work, extensive data had been acquired from subject A.W.; other lucid-dream Subjects however were not forthcoming. The simulating Control experiment indicated that A.W.'s signaling was from Stage REM sleep. The attempt to obtain lucid-dreams in the sleep-lab by an induction method was found not to be feasible. At this stage, subject A.W. offered to continue experiments, so a 2nd A.W. study was planned.

The next Chapter gives the results of further experimentation using this co-operative Subject.

CHAPTER XIII

THE 2nd A.W. STUDY

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CHAPTER XIII

XIII.7 INTRODUCTION.

The 1st A.W. Study provided adequate electro-physiological data for statistical analyses, and also a certain amount of psychological information concerning the lucid-dream state. At its conclusion, the Subject expressed an interest in extending the experimentation, so a 2nd A.W. study was planned. Unfortunately, the subject's frequency of lucid-dreams is such that specific numbers of lucid-dreams could not be expected to be obtained within the given period. The subject's visits to the sleep-lab would be necessarily limited. Therefore, a flexible investigative study was envisaged to observe various basic phenomena of lucid-dreams. Such an approach would not be so limiting as one experiment in which, say, the Subject signaled learned information over a series of lucid-dreams in order to shed light on the ability to recall material in the lucid-dream state.

The Subject's powers of introspection and intelligence would be particularly useful for subjective reports of dream events. Various manipulations e.g. external stimulation, could be performed in this 2nd Study, however as this would make the dreams essentially different from those of the 1st Study, results would not be pooled in analyses.

Aspects requiring elaboration would include: 2-way communication; whether any other physical actions are possible in lucid-dreams; and whether some other form of external stimulation could initiate lucidity, despite the general failure of the water-spray experiment on naive Subjects.

From the point of view of increasing the possibilities for experimentation, also from the philosophical aspect concerning whether the Subject really can think in dreams, the question of 2-way communication in lucid-dreams is of major importance. A problem presenting itself in investigations involving external auditory stimulation in a lucid-dream is the possibility of waking the subject. Therefore it was decided that olfactory stimuli would be employed first upon attainment of lucidity. It was assumed these would be less likely to rouse the Subject. If the Subject could signal back, by prearranged code which of several stimuli were presented during the lucid-dream, this would constitute 2-way communication and show the presence of intelligent mentation. The later auditory stimuli could consist of saying aloud instructions to the subject to perform calculations and to signal the result.

Ocular communication may not be the only method of conveying information from lucid-dreams, despite general bodily paralysis. It occurred to the author that perhaps the respiratory rate could be altered in that state. (The author believed he could alter his breathing rate in a related REM phenomenon – sleep-paralysis.) This could be ascertained fairly easily be requesting the Subject to deliberately vary his respiration in the lucid-dream, in some pre-arranged manner. If it worked it could open up a new channel for communication from the sleeping Subject.

The author came across a paper by Koulack (1969) which showed that electrical stimulation of the wrist had a high rate of incorporation in ordinary dreams (40% direct, plus 24% indirect). The method is easier and more efficacious than water-spray stimulation. The stimulus is constant, and its operation can be directed while observing the polygraph chart. Therefore it was planned to perform a pilot investigation using such stimulation in a fresh attempt to initiate lucidity in this habitual lucid-dreamer.

All three approaches are aimed at improving the efficiency of research methodology regarding lucid-dreams as well as investigating crucial areas.

XIII.2 METHOD.

The same Subject and electrophysiological recording set up were used as in the 1st A.W. Study.

a. 2-way communication experiment

This experiment was performed throughout the study in an attempt to establish 2-way contact between Subject and Experimenter. Two methods were tried:

1. Olfactory input to Subject.

Three olfactory stimuli (lemon scent, peppermint toothpaste, cloves) were employed in the experiment. The Experimenter selected a random order for 3 trials by assigning a number to each stimulus and observing which came first in random-number tables, opened blindly. The probability of the subject identifying all three and reporting them correctly by ocular signaling is $(1/3)^3$ i.e. $P = 1/27 = 0.037$. It was pointed out to the Subject that the same stimulus might occur twice or even on all three trials, by chance.

On attaining lucidity, the Subject signaled that fact. The Experimenter then entered the sleep-lab bedroom with the stimuli and placed each, in its randomly chosen order, close to the Subject's nose. His eye-movements were observed and after signaling which stimulus had been applied, the next was then presented. Because low numbers of ocular signals could be confused with ordinary REMs, it was established that the Subject would signal ‘2’ for lemon, ‘4’ for toothpaste, and ‘6’ for cloves.

2. Auditory stimuli.

After the olfactory stimulation the Experimenter said aloud 2 numbers (1-9) separated by a calculation instruction (e.g. 8 minus 3). The subject was instructed to signal each number and the result of the calculation. The numbers were selected by blind entry to random number tables. The higher number was given first and a gap of at least 1 was considered necessary so that an answer could be transmitted.

b. Respiratory rate experiment.

In later lucid-dreams, respiration was monitored by taping a micro-miniature glass-bead -coated thermistor near a nostril so that it registered the difference in temperature between inspired and expired air. One of the EOG channels was utilised for the purpose. A d.c. PGR bridge circuit set the baseline, and gain was varied between 0.05 and 0.02 mV/cm. The Subject was instructed to perform several rapid respirations at some point in a later lucid-dream.

c. Electric-shock stimulus.

It was hoped that mild electric shocks administered to the Subject in Stage REM sleep would be registered and possibly initiate lucidity if the Subject could realise that they were in fact external ‘prompting’ signals. Two 1½ volt batteries (HP11) in series were connected via a potentiometer and push- button to a transformer (Radiospares type 217-567) giving a x30 increase in voltage. Two electrodes (1cm diameter) were attached to the Subject’s left fore-arm some 2-3 inches apart.

Electrode gel was used with the electrodes. A problem was the threshold of shock. It seemed to be high in REM sleep, and if the Subject woke suddenly, he complained that it was too painful.

XIII.3 RESULTS.

The 2nd A.W. Study covered 30 recording nights - 7 groups of 3 successive nights (weekends) and a period of 9 successive nights. The total period during which the experiments were performed lasted just over a year In those thirty nights, 5 lucid-dreams were reported, but 1 was not recorded polygraphically due to technical difficulties. In addition, 2 induced false-awakenings were obtained.

LUCID-DREAM 1 (See account on pages 394-395)

Time: 10.20 a.m.

This lucid-dream had a duration of approximately 65 seconds. The ocular signals appeared after the customary REM burst, but very little REM activity occurred thereafter. The signals were made while the S was flying, although the Subject thought he was in a light sleep. Immediately it became a false-awakening however. During that period the lemon stimulus was presented but the Subject did not directly incorporate that smell into the dream. The Subject woke before further olfactory and auditory stimuli could be applied. It would seem that olfactory stimuli are not incorporated into the dream. It might be said that he was not expecting one at the time because he dreamed he had woken, but the stimulus is fairly pungent and was applied close to the nose for many seconds. In addition the ‘thing on the eyes’ (cotton-wool impregnated with a liquid?) might have had some kind of smell in the dream, but it did not.

LUCID-DREAM 2 (See account on page 396)

Time: 3.55 a.m.

A REM burst preceded the ocular signals in this lucid-dream, which was recorded at slow speed (25mm/sec). Again, the Subject signaled while flying. The duration of the experience was about 100 seconds, although the Subject believed it to be brief. Perhaps a false-awakening occurred after signaling. The Experimenter was not present unfortunately when the dream was recorded so no stimuli were administered. However, effectively, it was a Control situation where no smells were presented. No strong smells were reported though except for a very faint odour of lemon - so the Subject reported.

LUCID-DREAM 3 (See account on pages 398-399)

Time: 10.10 a.m.

Preceded by a distinct REM burst and lasting some 60 seconds, this lucid-dream showed little ocular movement after the realisation. The Subject was flying again while signaling. A false-awakening happened again too after signaling, as occurred in lucid-dreams 1 and 2. No stimuli were presented and none reported.

LUCID-DREAM 4 (See account on pages 400-402)

Time: 11 a.m.

Vigorous REM activity preceded the lucidity-signals here and the dream had a duration of some 35 seconds. REMs continued after lucidity, and the record (page 246) shows a fast respiratory rate there as was reported in the dream account. The Subject had been instructed to alter his breathing rate early in the lucid-dream, which he accomplished. This provides evidence that another voluntary activity available in dreams is that of controlling respiration. The subject woke before olfactory and auditory stimuli were applied. The subject reported that he ‘induced’ the lucid-dream be concentrating on visual imagery and then moving into that scene. He also reported hearing his breathing when trying to alter the rate, but on the other hand a clock ticking loudly close to the Subject was not heard. It is conceivable that the high respiratory rate resulted in an increased metabolic rate which increased cortical arousal so causing waking.

Induced false-awakening 1 (See account on page 402)

Time: 5 a.m.

The subject was electrically stimulated in tonic REM by a sequence of 3 shocks. The subject responded by signaling 8 ocular movements but the REM activity was minimal for the 30 seconds or so duration of the experience. This constituted the first known electrically induced false-awakening , although of course it had been hoped that full lucidity would be initiated. The Subject's head was covered, so no olfactory stimuli could be applied. The Subect woke, or was already awake, when the first number was spoken.

Induced false-awakening 2 (See account on pages 403-404)

Time: 10.15 a.m.

Three shocks occurring in low-voltage REM activity triggered the false-awakening here - the duration of which is difficult to determine since the EEG becomes like that of waking after some 25 seconds, but the EMG remains low for some 65 seconds. Two olfactory stimuli were presented during the latter part of the experience and correctly signaled, but the Subject was probably awake then.

On 3 occasions within the same REMP the Subject produced ocular signals in Stage 2 sleep, immediately following a k-complex (see pages 405-407). Presumably a burst of internal excitation was interpreted as being an electric shock. These were not observed at the time as they were outside a REM period. They are interesting because they show (a) the subject can signal in NREM sleep, and (b) the k-complex is a strong internal sensation which can be misinterpreted by a current psychological set. The subject had no recall of these events on later waking. It is not known therefore if they briefly elicited lucidity or whether the ocular responses were automatic.

XIII.4 DISCUSSION.

The lucid-dreams in this study appear different from those of the 1st study in that more false awakenings were present (3 out of 4 recorded dreams). In addition the electrical stimulation method produced 2 false-awakenings. It seems possible that the changed nature of the experimentation in the 2nd study could have caused this effect. A number of explanations may be offered. Perhaps the Subject was so ‘set’ to the sleep-lab situation regarding the tasks, that he naturally dreamed he was in bed after a time in spontaneous lucid-dreams or on electrical stimulation. However, the verisimilitude was such that he failed to recognise the artificiality of the situation. Another explanation is that dream imagery deteriorated, so ending the dream when the Subject disregarded it in favour of the tasks. The consequence could be a false-awakening. Or again, perhaps the false-awakening was a psychological defence to avoid having to perform the tasks. The 4 dreams seemed generally shorter in length than those in the 1st study, but not significantly so (t = 1.77; d.f. = 10; n.s.) Thus it seems that the experimental conditions were in some way non-conducive to the production of ordinary lucid-dreams. The answer to this problem may be to avoid burdening the Subject with several specific tasks in the dreams. Also, the Subject should perhaps simply allow the dream to run on for a while at first before attempting to perform experiments. If a false-awakening does occur, the Subject should be prepared for that eventuality and test the situation.

One method the Subject intends to use in future is to try to switch on a bedside lamp in the dream. In lucid-dreams this is not usually possible (see page 324). The lamp appears not to work. If it doesn't work the Subject should assume he is still asleep and dreaming. It is possible that at that point the dreamer may enter an 'out of the body' experience, in that the situation will be like real-life.

Regarding the 2-way communication experiments, these turned out to be rather indeterminate. On the occasion when stimulation was applied but not expected, it was not incorporated. When it was experienced, the Subject was almost certainly awake. The fact too that the Subject reported hearing his own breathing, yet did not register the loud clock, indicates that perhaps the respiratory sound was hallucinated – as was the sound of the micro-switch when it was not actually pressed, on previous occasions.

As regards the subject flying in lucid-dreams, only 1 good sample of flying, clearly marked by signals before and after, has so far been obtained (page 204). Although the subject reported flying and signaling on several occasions the two activities are mixed. If enough examples of flying could be collected, these could be compared for similarities. On the three times in this study when the Subject was flying and signaling the EEG baseline shows a large slow wave over several seconds (e.g. page 397). It is not known whether this is due to some movement artefact, say head movement (but it is not reflected in the other channels), or whether it is a specific very slow brain wave associated with flying in dreams. The effect is not present though in lucid-dream H of the 1st A.W. study (page 177).

The Subject's definite change in respiratory rate (see record on page 246) provides the first evidence for the voluntary control of breathing in Stage REM.

The chart speed was unfortunately slow in the polygraphic record though, so further examples are really required for this effect to be demonstrated conclusively.

The new method of producing false-awakenings if not lucid-dreams by using electrical stimulation is of possible great importance for future work. A large scale experiment is required to test the technique on several Subjects over a period (see also Chapter XIX, page308).

XIII.5 CONCLUSIONS.

The experimental situation can, apparently, significantly affect the duration, at least, of lucid-dreams. The several false-awakenings in this 2nd study might also reflect this phenomenon. These factors need to be considered in future work, as other aspects of lucid-dreams might be similarly affected.

Inconclusive results were obtained regarding the reception of external stimulation within the lucid-dream or false-awakening. It could be, in fact, that external stimulation is not incorporated at all in phasic REM, but is only hallucinated then, hence other stimuli (e.g. the clock) are not received.
A new study of external stimulation is called for, in which stimulation occurs in both tonic and phasic REM.

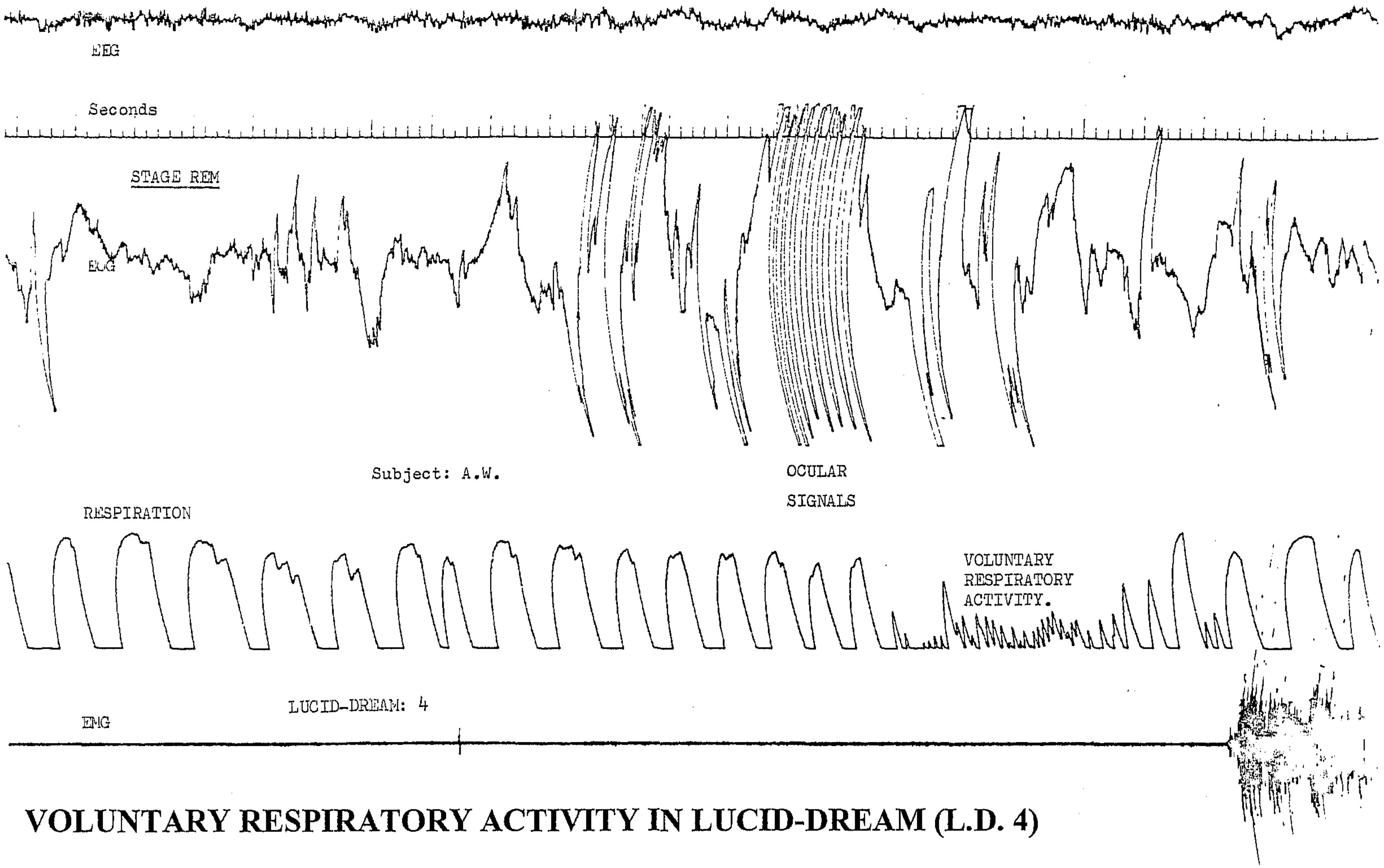
It is feasible for the lucid-dream Subject to mark specific dream activities by ocular signals. It is conceivable that this technique will open up an interesting area in future research, as different activities may have characteristic EEGs.

The results indicate that another channel of communication might exist for the Subject - that of respiratory signaling.

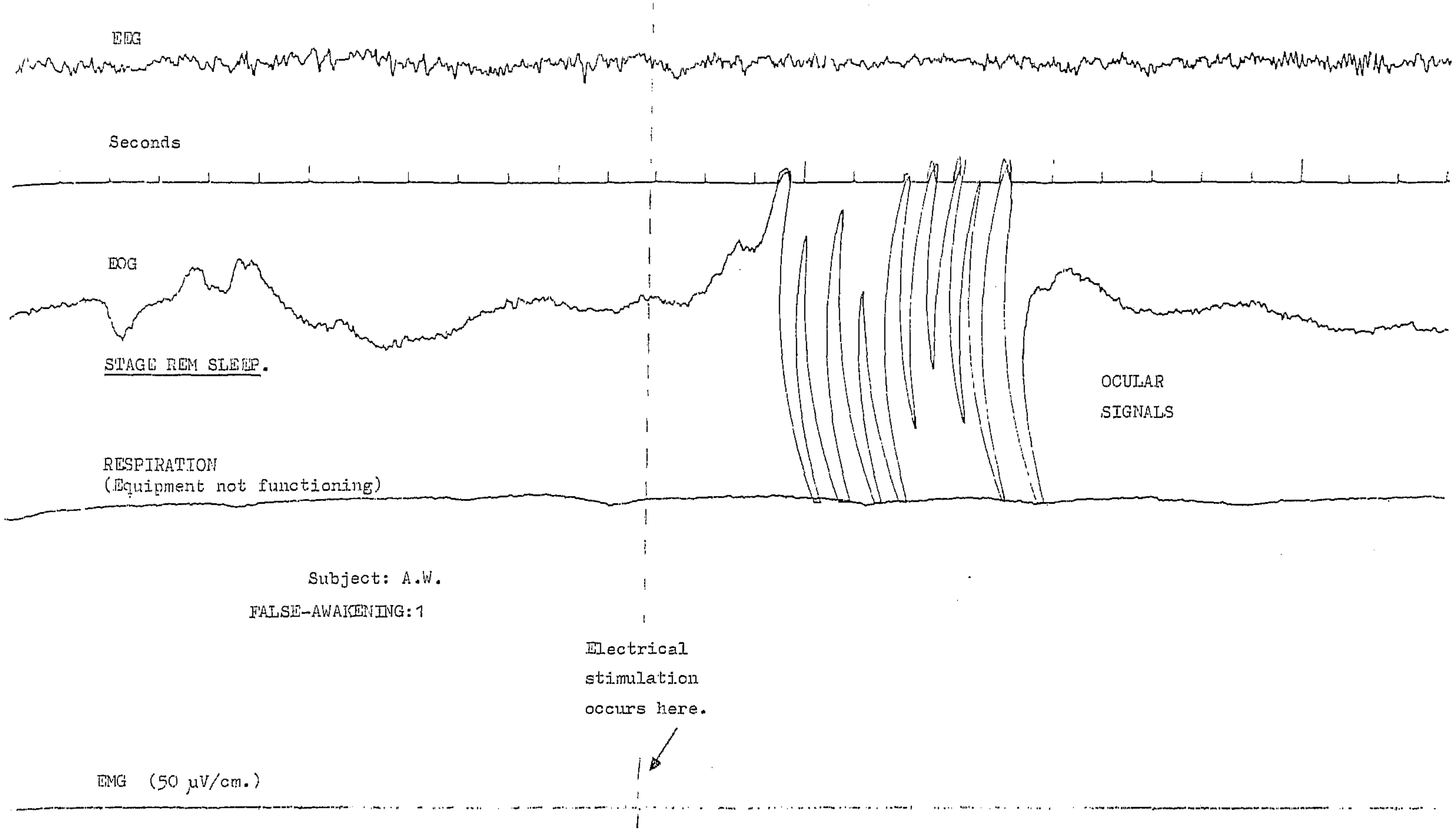
It seems possible that a method of inducing lucid-dreams and false-awakenings could be developed using electrical stimulation in Stage REM sleep.

The 2nd A.W. study was hampered, then, by an abundance of false-awakenings instead of lucidity, hut several promising observations have resulted which might provide the groundwork for future studies.

The next Chapter examines and analyses additional data (questionnaire, diary, lucid-dream frequency) supplied by Subject A.W. over a long period. This information should illuminate several aspects of naturally occurring (home) lucid-dreams.



VOLUNTARY RESPIRATORY ACTIVITY IN LUCID-DREAM (L.D. 4)



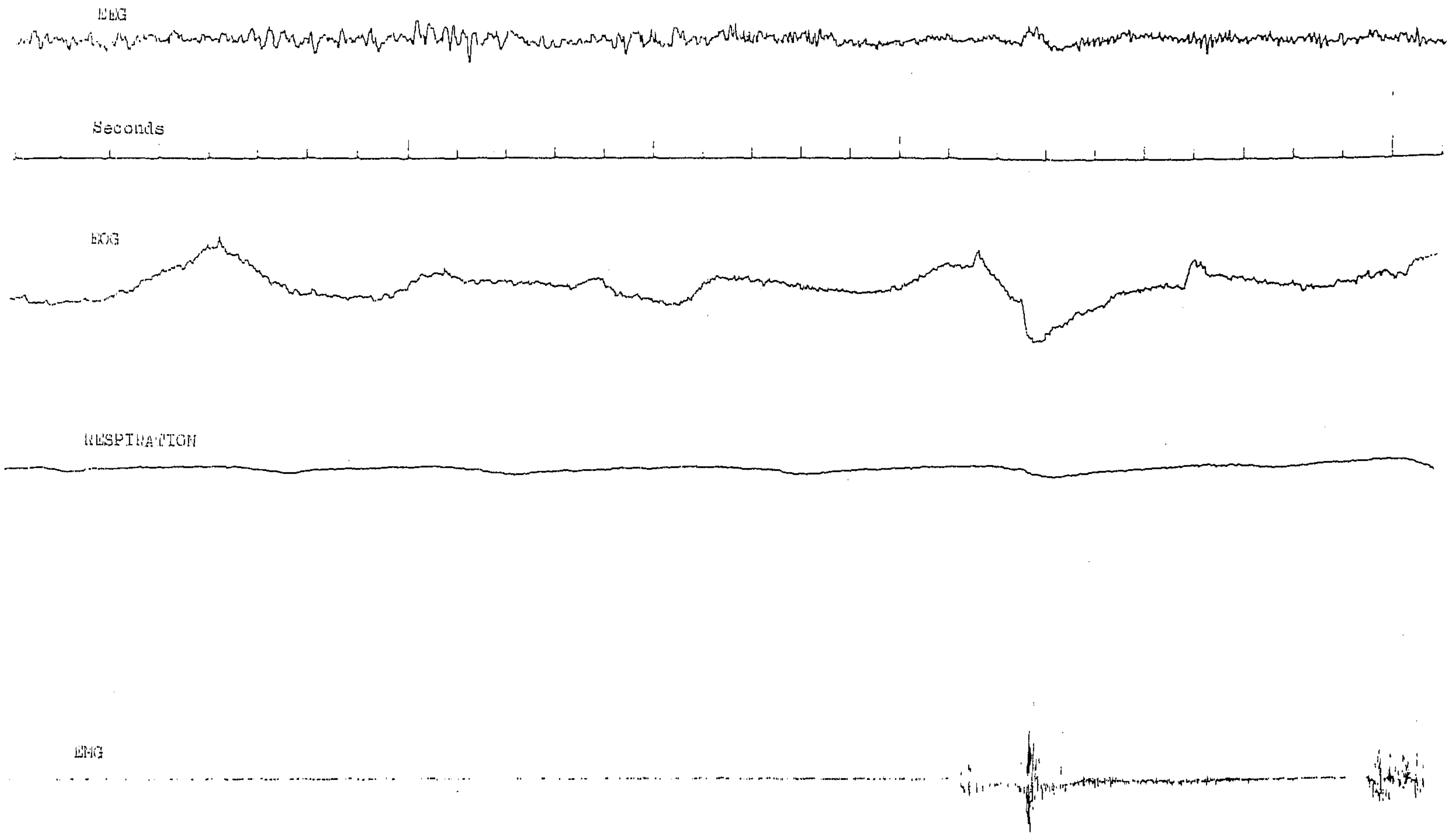
Subject: A.W.

FALSE-AWAKENING: 1

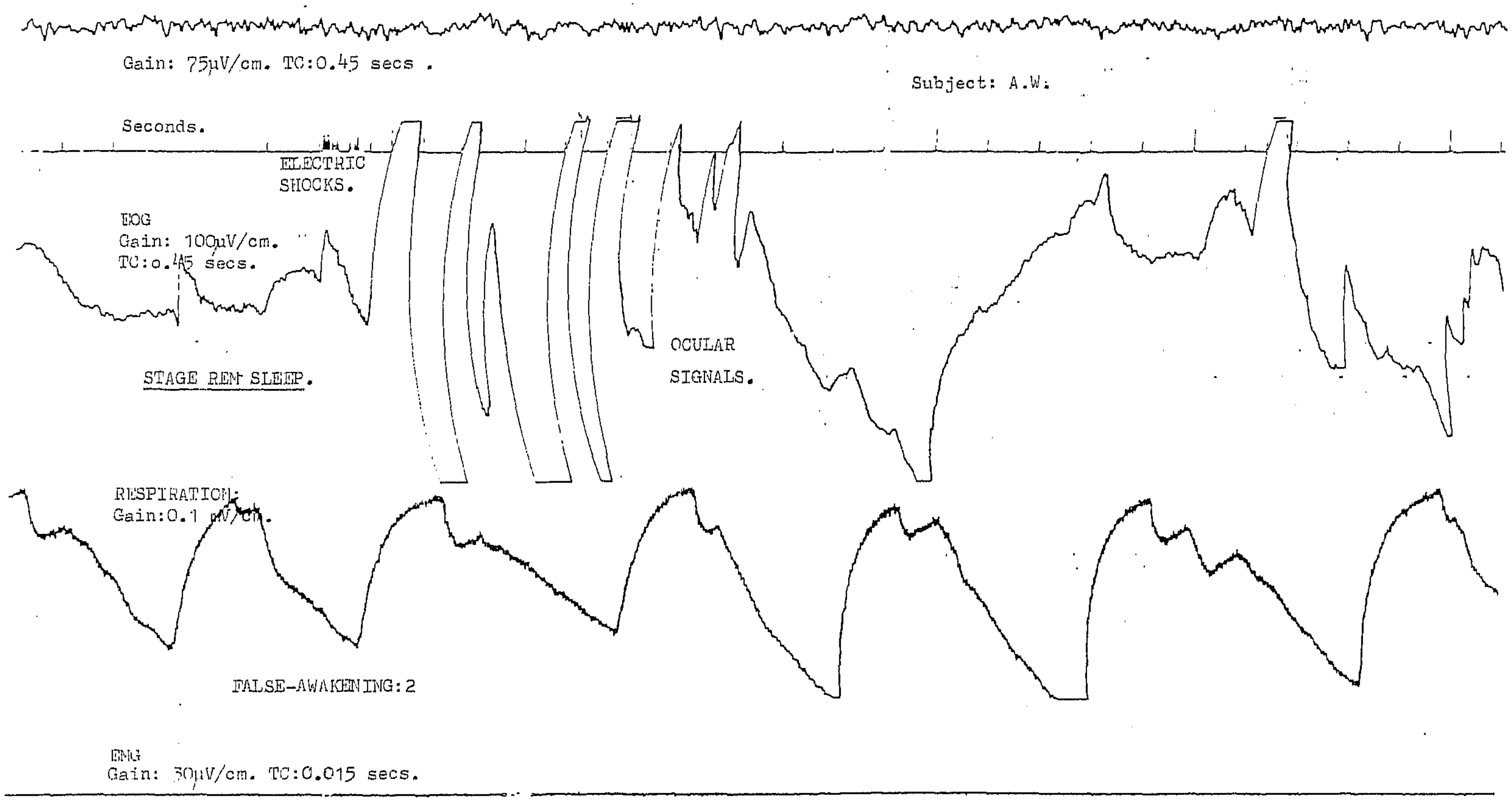
Electrical
stimulation
occurs here.

CASE OF ELECTRICALLY STIMULATED FALSE-AWAKENING (Continued....)

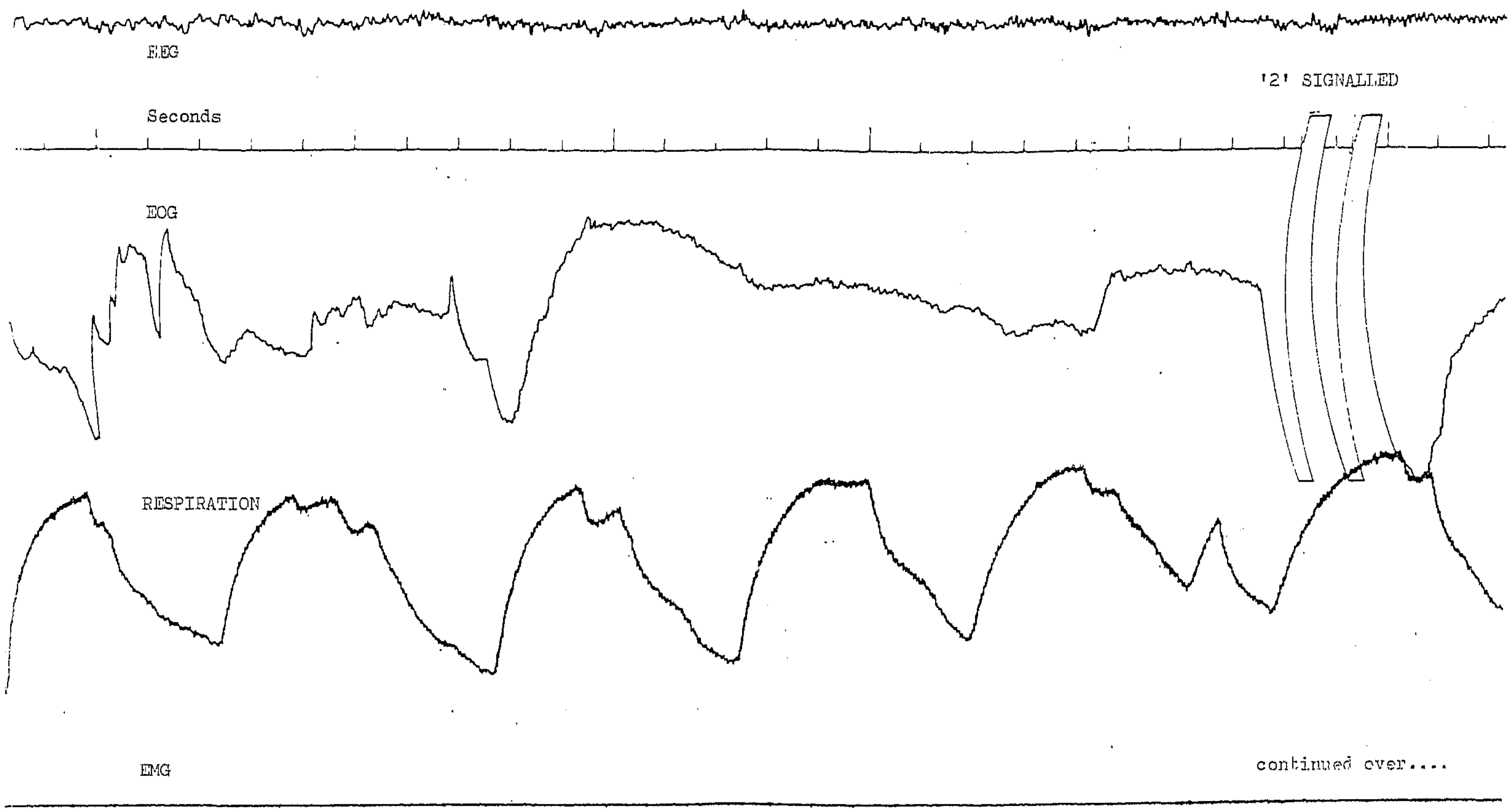
Subject: A.W.



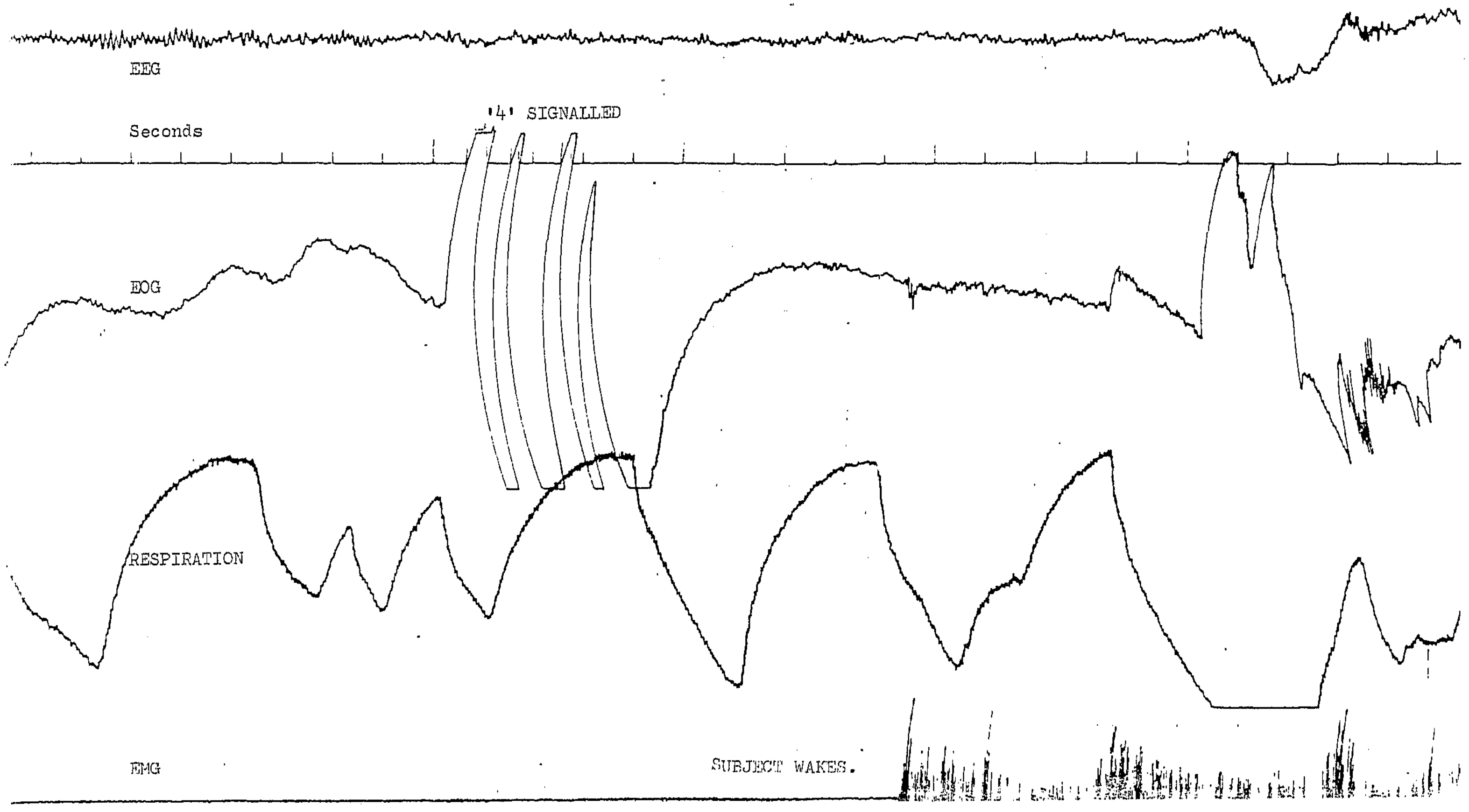
..... continued



FALSE-AWAKENING INITIATED BY ELECTRICAL STIMULATION (Continued...)


EEG
'2' SIGNALLED
Seconds
EOG
RESPIRATION
EMG
continued over....

......continued.....



......continued

CHAPTER XIV

ADDITIONAL DATA FROM SUBJECT A.W.

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CHAPTER XIV

ADDITIONAL DATA FROM SUBJECT: A.W.

This Subject tape-recorded his lucid-dreams and some ordinary dreams, on waking, over a 170 day period from August 1st 1976 to January 17th 1977. For part of that time a questionnaire was filled-in after each lucid-dream, and a diary was kept of each day's events. The data obtained is analysed here.

XIV.1 FREQUENCY DATA.

XIV.1.1 INTRODUCTION:

A record of those nights on which lucid-dreams are experienced enables these questions to be answered:

a. What is the subject's overall frequency of lucid-dreams during the period?

b. Are there any periodicity effects, as reflected in a recurring figure of days between lucid-dreams, or a bias for certain days of the week ?

Any finding of periodicity could point to underlying causative factors concerning these dreams, in terms of regular external (environmental) and/or internal (psychological / physiological) influences.

XIV.1.2 RESULTS:

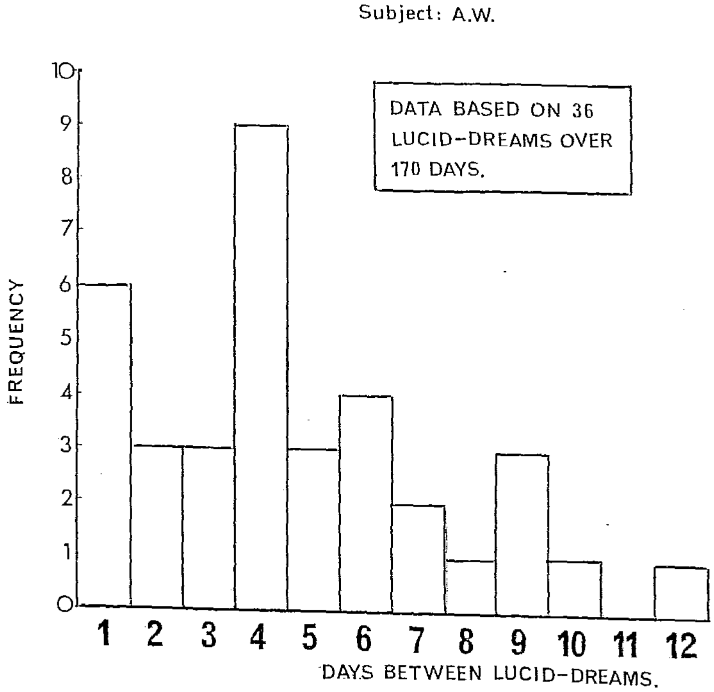
Figure XIV.1 (below) presents those days during the sampling (...cont. p. 255)

FIGURE: XIV.1 (O = No lucid dream; 1 = Lucid dream)

LUCID-DREAM OCCURRENCES OVER 170 DAYS:

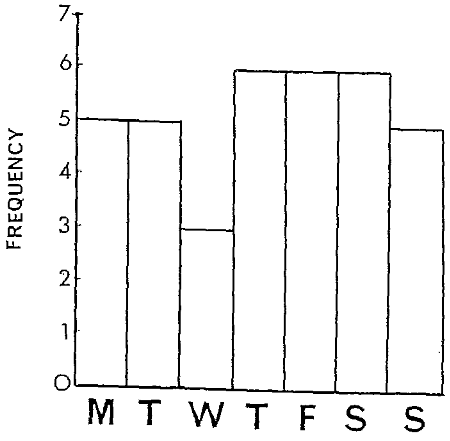
O O 1 O O O 1 O O O O O O 1 O O O O O O O O 1 O O (25)
1 O O O O O O O O 1 O O O 1 O O O 1 O O O O 1 O O (50)
1 1 O O O O O O O 1 O O O O O 1 O O O 1 O O O O O (75)
1 O O O O O 1 O O O O O O O O O 1 O O O O O O O O (100)
1 O O 1 O O O 1 O O O 1 1 O O O O O O O O 1 O 1 O (125)
O O 1 O O O O 1 O O O O O O O O 1 O O O 1 O O O O (150)
O O O O O O O 1 1 1 O O O O O 1 O 1 1 1 (170)

FIGURE XIV.2



A. FREQUENCY OF LUCID-DREAMS FOR DIFFERENT INTERVALS.

FIGURE XIV.3



B. DISTRIBUTION OF LUCID-DREAMS OVER DAYS OF WEEK.

period on which lucid-dreams occurred. Mostly they were spread out, but some bunching is apparent at the end of the sampling period. The overall frequency of lucid-dreams was 1 per 4 or 5 days (36/170). Figure XIV.2, page 254, illustrates the frequency of lucid-dreams for different intervals between their occurrence. It can be seen that one-quarter (9/36) of them happened 4 days after a previous one, and one sixth (6/36) were experienced the next day after a lucid-dream - these are the most common frequencies. The maximum duration between lucid-dreams was found to be 12 days.

Figure XIV.3 shows that the distribution of lucid-dreams was more or less equal for the different days of the week, with a slight non-significant decrement on Wednesdays (page 254).

XIV.1.3 DISCUSSION:

This particular Subject does appear to have a degree of cyclicity in the frequency of lucid-dreams. The 4 day periodicity effect accounts for 25% of the data. It would be of interest to discover whether this is linked to any other aspect of the Subject's behaviour. For instance, perhaps lucid-dreams are associated with peaks of cortical activity at 4 day intervals. This might be reflected in, say, his personality i.e. he could be more introverted on those days (Chapter XVI). A causal link too might be established by a detailed analysis of the Subject's daily activities.

XIV.2 DIARY DATA.

XIV.2.1 INTRODUCTION:

The concept that the day's events can affect that night's dreams is a familiar one. It is a common observation for most people, and is an integral part of Freudian and Jungian dream theory (IV.5, IV.6). Two questions therefore spring to mind vis à vis lucid-dreams:

1/ Is lucidity in dreams linked to specific events in the day before?

These events may have some special psychological significance for the person and a replay in dreams may cause cortical arousal so perhaps initiating lucidity.

2/ On days before lucid-dreams, does the person experience more general stimulation (activity / emotional arousal)? This follows on from the notion that lucidity arises from cortical excitation. Many interesting events in the day might lead to more cortical activity in dreams, hence lucidity.

A study of diary data might establish whether these two factors are important or not.

XIV.2.2 METHOD:

The subject (A.W.) was requested to keep a diary of each day's events over a period of several weeks. A continuous record was not maintained, however enough data was collected for 8 days followed that night by a lucid-dream, and 8 other days which were not followed by a lucid-dream.

The S was asked to put entries into the diary on an hour-by-hour basis, and in no circumstances to fill in the data for a previous day in case the Subject's personal ideas on any possible links between events and lucid-dreams affected his diary entries. Control days were randomly selected, but were matched for day of week for obvious reasons.

Measures:

A measure of experienced-stimulation during the day was derived from the diary information by scoring the amount of activity and emotional arousal. Three naive judges rated lucid and non-lucid dream days, randomly presented. The mean score was rounded off to the nearest whole number. The criteria were:

1/ Any recorded non-routine activity, 1 point.

2/ Any recorded emotional event, 1 point.

Any link between references to specific activities or persons and lucid-dreams would be investigated by noting their presence or absence in the 2 sets of E and C data. For the 8 separate items of' E and C data, the presence of a reference in 8 cases in one set and 0 cases in the other, would be statistically significant (Binomial probability: P = 0.002, 2 tailed). For 1 and 7 cases, P would be approaching significance (P = 0.070, 2 tailed).

XIV.2.3 RESULTS:

(a) Diary references and lucidity.

The various items compared are shown in the Appendix, page 411. No specific activity or reference to a person appears to be linked with lucidity in a dream that night. Of the 10 items compared, the greatest discrepancy concerns reference to alcoholic drink. Two of the E days and 6 of the C days have such an entry, however, the trend is not significant.

(b) Daytime stimulation and lucidity.

An independent t-test was used to compare the E and C data scores on general daytime stimulation (See table below). There was no significant effect for E days (followed that night by a lucid-dream) compared with C days (not followed by a lucid-dream. (t = 1.77; d.f. 14; n.s.).

TABLE XIV.1

DIARY DAY-TIME STIMULATION SCORES.

E	**C**
8	7
7	6
4	4
4	3
4	3
6	6
5	2
6	4
Mean: 5.5	Mean: 4.37

XIV.2.4 DISCUSSION:

The amount of general stimulation was found not to be significantly higher on days before lucid-dreams, but there appears to be a trend that way. The information though concerns only this Subject and is open to all the criticisms of subjective data, however it points to an association which should be further investigated. The concept, stated in the Introduction, that perhaps a more interesting (to the Subject) day leads to greater cortical arousal in dreams and so makes lucidity more likely, requires further study.

The other aspect of this Study has shown that certain specific events in the day before do not appear to be associated with lucidity in dreams that night, although the level of analysis was not detailed.

XIV.3 Post-lucid-dream Questionnaire.

XIV3.1 INTRODUCTION.

The purpose of the post-lucid-dream questionnaire was to obtain subjective information on various aspects of the dream, before and after lucidity, which were described in Chapter V. The items would be: imagery brightness and clarity, emotional level, clarity of thought and bizarreness of the dream. In addition, questions would be asked on estimated duration, likelihood of the events actually happening in real life, and ability to control the dream. These were to ascertain how different experientially, lucid-dreams are from their ordinary-dream 'matrix', and to investigate how the phenomenon of dream control correlates with any of these data.

XIV.3.2 METHOD.

The Subject was asked to fill in the questionnaire (See Appendix, pages 408-410) on waking after a lucid-dream. This was usually performed after the Subject had recorded an account of the dream.

XIV.3.3 RESULTS.

The Subject completed the questionnaire after 29 lucid-dreams. The answers were in the form of numerals on a scale from 1 to 7. Raw data is shown on page 265. The time estimation data is in seconds. Since a few persons who reported experiencing lucid-dreams told the author that thinking in them could sometimes be 'clearer than when awake', the scale for items 6 and 7 was extended to cover that.

'Before and after' data was subjected to Sandler's A test, and the entire data was cross-correlated using a computer program (N31C - of the University of Liverpool Computer Laboratory). The resultant correlational matrix is shown on page 266.

The mean ratings for the first 4 items in the questionnaire (see Table XVI.2, page 265), concerning the brightness and clarity of imagery before and after lucidity, were around the centre of the scale (1 no imagery, 7= like in strong sunshine).

Mean brightness before lucidity:	3.7
Mean brightness after lucidity:	3.8
Mean clarity before lucidity:	4.3
Mean clarity after lucidity:	4.4

The mean estimated duration of the lucid-dreams was 156 seconds, which is very similar to the mean duration of 153 seconds found in the sleep-lab study . The estimated range was from 5 to 360 seconds. A t-test showed that the sleep-lab duration figures were not significantly different from the mean estimated duration of the large sample of home lucid-dreams (t = 0.09; 7 d.f.; n.s.).

The mean level of quality of thought was found to be a little less than in waking life both before and after lucidity:

Mean clarity of though before lucidity:	2.6
Mean clarity of though after lucidity:	2.6

(Scale: 1 = very unclear, 4 = same as when awake, 7 = much more clear).

The mean level of emotionality was fairly low both before and after lucidity:

Mean emotionality of dream before lucidity:	2.8
Mean emotionality of dream after lucidity:	3.3

(Scale: 1 = unemotional, 7 = extremely emotional).

The bizarreness of the dreams was, on average, not very great before or after lucidity:

Mean bizarreness before lucidity: 2.8

Mean bizarreness after lucidity: 3.6

(Scale: 1 = not bizarre, 7 = extremely bizarre).

On average, the dream events concerned things which could possibly happen in waking life: 4.4 on scale (1= very unlikely to happen, 4 = possible, 7 = very unlikely).

The mean level of dream-control after lucidity was 4.7 on the scale (1 = no control, 7 = very easy to control).

Sandler's A test findings:

1. Brightness of imagery before and after lucidity:

   A = 0.56. Not significant.

2. Clarity of imagery before and after lucidity:

   A = 0.33. Not significant.

3. Clarity of thought before and after lucidity:

   A = 0.06. $P < 0.0001$

   Subjectively, thinking was significantly clearer after lucidity.

4. Emotionality before ands after lucidity:

   A = 0.14. $P < 0.01$

   Emotionality in the dream was subjectively greater after lucidity.

5. Bizarreness before and after lucidity:

   A = 0.15. $P < 0.01$

   Dreams were more bizarre, subjectively, after lucidity,

Listed below are pairs of measures which attained overall significant levels of association using N-2 degrees of freedom, 2-tailed, and the 5% level of significance: as a minimum.

(Table values (overall data): 5%: 0.37; 2%: 0.43; 1%: 0.47).

The data was also split (days 1-15, 16-29) and separate correlations computed to check whether any apparent overall significant correlation was consistent throughout the data. As 78 overall correlations were performed, approximately 4 spuriously significant correlations might be expected by chance alone (at the 5% level).

(Split data table values: 13 d.f. - 5%, 0.51; 2%, 0.59; 1%, 0.64
12 d.f. - 5%, 0.53; 2%, 0.61; 1%, 0.66)

Correlations. (SEE TABLE XIV.3, page 265, and FIGURE XIV.4, page 266)

1. Brightness of imagery before and after lucidity:
r = 0.91 $P < 0.01$ Split: 13 d.f.: 0.84; $P < 0.01$
12 d.f.: 0.98; $P < 0.01$
2. Brightness after lucidity and clarity before lucidity:
r = 0.50 $P < 0.01$ Split: 13 d.f.: 0.56; $P < 0.05$
12 d.f: 0.42; n.s.
3. Brightness after lucidity and clarity after lucidity:
r = 0.44 $P < 0.05$ Split: 13 d.f.: 0.58; $P < 0.05$
12 d.f.: 0.21; n.s.
4. Clarity before and after lucidity:
r = 0.90 $P < 0.01$ Split: 13 df.: 0.91; $P < 0.01$
12 d.f.: 0.89; $P < 0.01$

These 4 findings, with the Sandler's A test results essentially reflect the fact that the dream imagery does not subjectively appear to change in brightness or quality with the onset of lucidity. The non-significant correlations of some of the split data in items 2 and 3 of the list above indicates that the overall results are perhaps dubious.

5. Clarity of thought before and after lucidity:
r = 0.55 $P < 0.01$ Split: 13 d.f.: -0.26; n.s.
12 d.f.: 0.82; $P < 0.01$

This overall finding indicates that the greater the clarity of thought before lucidity, the more so after that point. However, the split halves of the data give different results, so this finding is suspect.

6. Emotionality before and after lucidity:

$r = 0.60$ $P < 0.01$ Split: 13 d.f.: 0.51; $P < 0.05$
12 d.f: 0.70; $P < 0.01$

The dream is subjectively more emotional after lucidity and the level of emotionality is dependent on the degree before lucidity.

7. Bizarreness before and after lucidity:

$r = 0.50$ $P < 0.01$ Split: 13 d.f.: 0.76; $P < 0.01$
12 d.f.: 0.15; n.s.

Overall, bizarreness of the lucid-dream appears to be linked to that measure before lucidity. However, the split analyses give different results, so the result is not reliable.

8. Bizarreness before lucidity and likelihood of events:

$r = -0.43$ $P < 0.05$ Split: 13 d.f.: -0.50; n.s.
12 d.f.: -0.31; n.s.

This overall finding is not reliable.

9. Bizarreness before lucidity and controllability of the lucid-dream:

$r = -0.43$ $P < 0.02$ Split: 13 d.f.: -0.33; n.s.
12 d.f: -0.60; $P < 0.05$

Whilst both split-data findings give negative correlations, they are different values, hence the overall finding is suspect.

In 16 of the 29 dreams the dream-situation was indoors.

TABLE XIV.2 Subject A.W.

RAW DATA. POST-LUCID-DREAM QUESTIONNAIRE (29 lucid-dreams)

Q1	2	3	4	5	6	7	8	9	10	11	12	13
4	4	4	5	250	2.5	4	4	5	4	4	3	5.5
4	4	4	4	190	2	4	1.5	3	2	4.5	5	4
2	2	4	4	60	3	3	3	2	2	3	4	5
4	4	4	4	330	3	3	2	2	2	2	6	5
4	4	4	4	100	3	3	3	4	2	4	2	4
5	5	5	5	240	3	3	3	3	6	6	2	2
3	5	6	6	150	2	3	5	4	4	4	3	5
5	5	5	5	60	2	3	5	4	3	3	5	5
4	4	6	6	200	3	3	2	2	3	1	7	6
2	2	4	4	150	3	3	2	2	5	6	4	4
4	4	4	4	360	3	3	2	2	1	1	6	6
4	4	4	5	200	2	3	3	4	3	3	6	5
3	3	4	4	60	2	3	2	3	2	2	4	4
3	3	3	3	10	3	3	2	3	2	2	6	2
4	4	4	4	200	2	3	2	5	1	2	5	5
4	4	4	4	200	2	3	2	5	4	4	4	3
3	3	4	4	120	2	3	4	4	4	4	4	2
3	3	5	5	150	3	4	3	4	2	4	1	6
4	4	4	4	100	2	3	3	3	4	4	5	5
4	4	5	5	250	2	3	2	3	2	6	6	6
3	3	5	5	200	2	3	2	3	3	5	3	5
1	2	3	4	5	2	3	6	6	3	6	6	4
6	6	5	5	120	3	3	3	4	3	5	6	5
4	4	4	4	100	3	3	2	2	2	6	6	6
4	4	4	4	200	2	3	2	2	4	2	1	6
4	4	4	4	30	4	4	2	2	2	3	5	5
3	3	4	4	120	4	5	3	5	1	1	6	6
4	4	4	4	250	4	4	3	3	3	4	4	4
4	4	4	4	120	3	4	2	3	2	2	4	5
3.7	3.8	4.3	4.4	156	2.6	3.3	2.8	3.3	2.8	3.6	4.4	4.7

(Means)

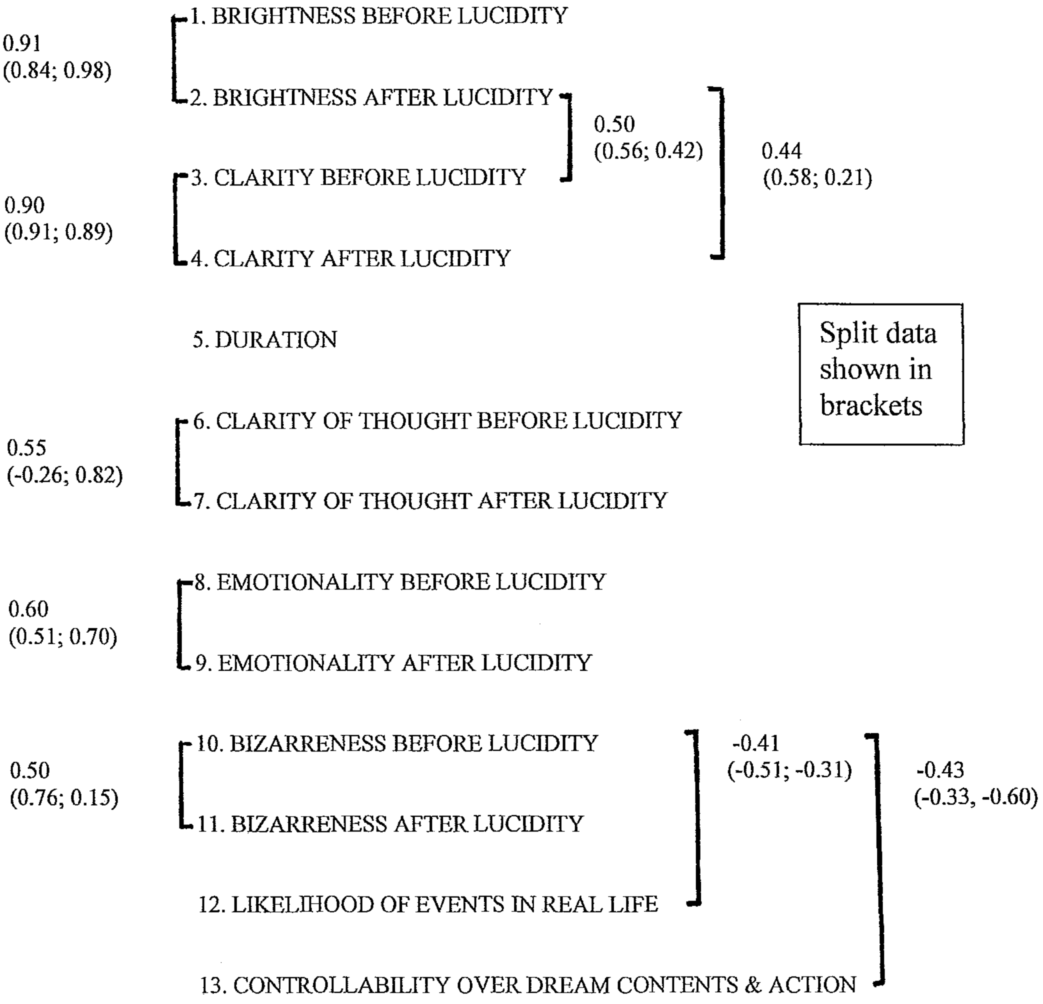
Sandler's A (Items 1 & 2): A = 0.56 Not significant.
Sandler's A (Items 3 & 4): A = 0.33 n.s.
Sandler's A (Items 6 & 7): A = 0.06 P < 0.001
Sandler's A (Items 8 & 9): A = 0.14 P = 0.01
Sandler's A (Items 10 & 11): A = 0.15 P = 0.01
(Table values: (29 d.f.) 5%: 0.264; 1%: 0.161; 0.1%: 0.106).

1. Brightness of imagery before lucidity.
2. Brightness of imagery after lucidity.
3. Clarity of imagery before lucidity.
4. Clarity of imagery after lucidity.
5. Estimated duration of lucid-dream.
6. Clarity of thought before lucidity.
7. Clarity of thought after lucidity.
8. Emotionality before lucidity.
9. Emotionality after lucidity.
10. Bizarreness before lucidity.
11. Bizarreness after lucidity.
12. Likelihood of actually experiencing dream situation.
13. Ability to control lucid-dream.

1	-											
2	0.91											
3	0.35	0.50										
4	0.26	0.44	0.90									
5	0.35	0.31	0.26	0.26								
6	0.08	-0.03	-0.08	-0.20	-0.01							
7	-0.02	-0.08	-0.12	-0.10	-0.01	0.55						
8	-0.24	0.02	0.08	0.31	-0.32	-0.21	-0.04					
9	-0.11	0.01	-0.12	0.10	-0.19	-0.30	0.19	0.60				
10	0.06	0.15	0.24	0.32	0.07	-0.25	-0.30	0.30	0.03			
11	-0.08	0.00	0.078	0.16	-0.09	-0.21	-0.21	0.25	0.14	0.50		
12	0.06	0.03	-0.14	-0.10	-0.05	0.11	-0.07	-0.09	-0.05	-0.41	-0.19	
13	0.13	0.12	0.32	0.35	0.24	0.10	0.23	-0.11	-0.17	-0.43	-0.25	0.14

TABLE XIV.4 CORRELATIONAL MATRIX
SUBJECIVE REPORTS, POST-LUCID-DREAM QUESTIONNAIRE
Based on 29 lucid-dreams.

TABLE XIV.3 STATISTICALLY SIGNIFICANT (OVERALL) CORRELATIONS AND SPLIT DATA CORRELATIONS


1. BRIGHTNESS BEFORE LUCIDITY
0.91
(0.84; 0.98)
2. BRIGHTNESS AFTER LUCIDITY
0.50
(0.56; 0.42)
0.44
(0.58; 0.21)
3. CLARITY BEFORE LUCIDITY
0.90
(0.91; 0.89)
4. CLARITY AFTER LUCIDITY
5. DURATION
Split data shown in brackets
6. CLARITY OF THOUGHT BEFORE LUCIDITY
0.55
(-0.26; 0.82)
7. CLARITY OF THOUGHT AFTER LUCIDITY
8. EMOTIONALITY BEFORE LUCIDITY
0.60
(0.51; 0.70)
9. EMOTIONALITY AFTER LUCIDITY
10. BIZARRENESS BEFORE LUCIDITY
-0.41
(-0.51; -0.31)
0.50
(0.76; 0.15)
-0.43
(-0.33, -0.60)
11. BIZARRENESS AFTER LUCIDITY
12. LIKELIHOOD OF EVENTS IN REAL LIFE
13. CONTROLLABILITY OVER DREAM CONTENTS & ACTION

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XIV.3.4 DISCUSSION

The results could be a function of the Subject's preconceptions, biases, responding sets, and various other psychological artefacts. However, taking them at face value as being truthful observations of subjective experiences, the findings indicate that the brightness and clarity of the dream imagery does not change after lucidity, but that clarity of thought, emotionality and bizarreness do increase at that juncture. The subjectively reported increase in emotional level could be explained by the Subject's excitement at achieving lucidity or it is perhaps more likely physiologically based in that the

heart-rate has been found to increase after a REM burst (which invariably preceded lucidity in the sleep-lab - Chapter VIII).
The physiological state might therefore direct the emotional level of the dream.

The significant increase in reported bizarreness of the dream after lucidity is somewhat unexpected, however it may be that the greater insight and observation after lucidity may expose bizarreness in greater relief.

The split-data correlations indicate that some overall significant associations may be spurious. A few robust correlations survive: The subjective levels of brightness and clarity of imagery were dependent on those levels beforehand. The subjective level of emotionality in the lucid-dream was associated to the level before lucidity. This level had already been shown to increase significantly on lucidity. Thus, in these 3 measures the pre-lucid state was crucial in that it set the level for the lucid-dream.

Further data from this subject and others should show whether the less reliable correlations are genuine.

XIV.3.5 OVERALL CONCLUSIONS

1. A degree of cyclicity (of 4 days) was apparent in this Subject's reported lucid-dreams.
2. Lucid-dreams occurred on all days of the week, with no apparent significant bias.
3. Lucid-dreams were found to occur more often after a day of above average stimulation (i.e. more non-routine activity or emotional events).
4. Specific events the day before, did not appear to be linked with lucid-dreams that night.

5. Subjective brightness and clarity of the dream imagery remain the same after lucidity as before.

6. Subjective clarity of thought, emotionality arid bizarreness in a dream increase significantly at lucidity.
7. Subjective brightness and clarity of the imagery, and emotionality of the lucid-dream are significantly associated with those levels before lucidity.

From the data supplied by this Subject it would seem that physiological factors are important regarding lucid-dreams. They could affect their very occurrence through cyclical rhythms and the amount of cortical excitation in the day before. Also, the emotional and imagery levels appear to be dependent on those levels existing prior to lucidity.

It was decided to attempt to discoverwhether the frequency of reported lucid—dreams (in a large group of persons) correlated with several imagery arid sleep phenomena, to see if any links were apparent which might throw further light on lucid—dreams. The next Chapter describes that work.

CHAPTER XV

QUESTIONNAIRE INFORMATION

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CHAPTER XV

QUESTIONNAIRE INFORMATION.

XV.1 INTRODUCTION.

Very little is known about lucid-dreams. An obvious possibility was that they were some form of imagery which does not occur in REM sleep, and so the phenomenon would not constitute real dreams. One way of studying this, without a sleep-lab, is to give an imagery questionnaire to persons who say they have lucid-dreams and see how the score correlates with reported frequency of lucid-dreams. Questions on various sleep phenomena could also provide correlational data. These questions (pages 414-417) would give information on associated phenomena - the correlations of which might point to possible causes or at least indirect links. It was decided to obtain such data. Male and female scores would be treated separately and combined to observe any sex differences.

At a later stage, the author considered that it would be useful to have general information on the personal experiences of Subjects in specific areas in lucid-dreams. The questions selected are shown on pages 281-283.

The questionnaire method has certain inherent biases of course. The Experimenter can affect the interviewees' responses (Hyman 1955); a social desirability factor (Edwards,1957) may operate ; an acquiescence tendency could distort some answers (Cronbach, 1942,Wiggins, 1962). Nevertheless, it was felt that this method could provide some useful information on matters related to lucid-dreams.

The imagery part of the first questionnaire (questions 4-16) was supplied by Dr J. Empson of Hull University.

It was felt that further pertinent questions might be on: eidetic ability, hypnagogic and hypnopompic imagery, perseverative imagery, body-schema experiences, micropsia and macropsia, apparitions, auras, daydream frequency and vividness of that imagery. (These types of imagery are discussed in McKellar, 1957). Questions on sleep / dream phenomena would be on frequency of recurring dreams, sleepwalking, sleeptalking, myoclonic jerk, nocturnal dream recall, vividness of dream-imagery and whether the person saw himself / herself in dreams. Other questions on peripheral interests of the author were also included.

XV. 2 METHOD.

(a) Lucid-dreams, imagery and ordinary dreams questionnaire.

The Experimenter personally canvassed a young adult University population and obtained questionnaire data from 48 persons (24 males, 24 females), who stated that they had lucid-dreams at a frequency represented by at least 2 on a scale of 1 (none) to 7 (every night). The University student population is not representative of society generally, it is noted, in that the intelligence level is higher than average and the age range is limited. Nevertheless, useful information can be ascertained from this sample. The data was placed in two 36 times 24 matrices (for the 2 sexes) and one 36 times 48 matrix (combined), which were subjected to cross-correlation using ‘N3IC’ computer programme of the University of Liverpool Computer Laboratory.

(b) Lucid-dream phenomena questionnaire. The answers to these questions were in categories, or simple yes/no responses. The answers were expressed in tabular form. Twenty-four persons took part (11 males, 13 females).

XY.3 RESULTS.

(a) Lucid-dreams, imagery and ordinary dreams questionnaire.

The male/female raw data is on pages 412-413 and a table of correlations for the items in relation to the reported frequency of lucid-dreams is shown on page 275. A table of means for the different questions is displayed on page 274.

It can be seen (page 274) that the mean reported frequency of lucid-dreams for the sample was 3.6 on the 7 point scale (3.0 males, 4.2 females). The overall imagery scores were 59.3 (males) and 65.3 (females), (62.3 combined). A significant difference was found between the frequency of reported lucid-dreams for males versus females ($t = 2.41$; $N = 24$; $P < 0.02$ (Page 418). The overall imagery scores of the two sexes were not significantly different though.

Totally different items correlated with the reported frequency of lucid-dreams for the two sexes. For males, belief in ESP (item 25) and reported frequency of daydreaming (item 27) correlated significantly (25: $r = 0.46$; $N = 24$; $P < 0.05$). In females, reported hypnagogic-imagery frequency (item 18), reported frequency of recall of nocturnal dreams (item 29), and reported frequency of seeing oneself in dreams (item 31) provided significant correlations (18: $r = 0.53$; $N = 24$; $P < 0.01$; 29: $r = 0.43$; $N = 24$; $P < 0.05$; 31: $r = 0.48$; $N = 24$; $P < 0.05$). However, when combined, 3 items which had correlated for males and females

(continued, page 277)

TABLE XV.1

LUCID-DREAMS, IMAGERY AND SLEEP/DREAMS QUESTIONNNAIRE.

(See pages 414-417).

MEANS OF RESPONSES.

ITEM	MALES (N=24)	FEMALES (N=24)	MIXED (N=48)
1	3.0	4.2	3.6
2	2.0	1.7	1.8
3	1.5	1.3	1.4
4	5.3	5.9	5.6
5	5.4	6.0	5.7
6	5.2	5.7	5.4
7	4.4	4.9	4.7
8	4.5	5.5	5.0
9	4.3	5.0	4.7
10	4.5	4.8	4.6
11	3.5	3.1	3.3
12	4.3	4.4	4.4
13	4.1	3.7	3.9
14	4.4	4.9	4.6
15	4.8	5.8	5.3
16	4.8	5.6	5.2
17	3.5	3.3	3.4
18	4.1	4.2	4.1
19	2.7	2.7	2.7
20	4.1	4.1	4.1
21	2.1	1.7	1.9
22	1.2	1.3	1.3
23	1.0	1.1	1.1
24	1.6	1.5	1.5
25	4.5	4.7	4.6
26	2.2	2.7	2.4
27	4.5	5.6	5.0
28	4.5	5.1	4.8
29	4.3	4.7	4.5
30	4.8	5.6	5.2
31	2.5	3.0	2.7
32	2.6	2.9	2.7
33	1.4	1.5	1.4
34	2.0	2.2	2.1
35	2.0	3.1	2.5
36	**58.3**	**65.3**	**62.3**

TABLE XV.2 CORRELATIONAL DATA (See questionnaire, pages 414-417)

LUCID-DREAMS, IMAGERY, DREAMS, QUESTIONNAIRE

(Significant values of r:
22 d.f.: 5% = 0.40; 2% = 0.47; 1% = 0.52.
45 d.f.: 5% = 0.29; 2% = 0.34; 1% = 0.37)

ITEMS	**MALES** (N=24)	**FEMALES** (N=24)	**MIXED** (N=48)
2	-0.08	0.33	0.05
3	0.11	0.28	0.12
4	0.01	0.01	0.07
5	0.16	-0.04	0.14
6	-0.12	0.19	0.07
7	0.17	-0.09	0.10
8	-0.07	-0.08	0.01
9	0.05	0.03	0.10
10	-0.35	0.12	-0.08
11	-0.09	-0.14	-0.14
12	-0.19	0.14	0.01
13	-0.14	-0.23	-0.20
14	-0.08	0.17	0.07
15	0.16	0.26	0.27
16	0.35	-0.20	0.23
17	0.05	0.10	0.05
18	-0.06	**0.56**	0.19
19	-0.01	0.19	0.07
20	0.31	0.06	0.17
21	-0.13	0.05	-0.10
22	0.36	0.06	0.161
23	0.36	-0.22	0.07
24	0.09	0.40	0.21
25	**0.46**	0.35	**0.40**
26	0.32	-0.24	0.10
27	**0.42**	0.06	**0.32**
28	0.10	0.07	0.13
29	0.21	**0.43**	**0.33**
30	0.07	0.39	0.25
31	-0.13	**0.48**	0.22
32	0.39	0.21	**0.30**
33	-0.08	0.31	0.14
34	-0.17	0.02	-0.06
35	0.14	-0.25	0.06
36	0.00	0.02	0.07

TABLE XV.3
SIGNIFICANT OVERALL CORRELATIONS AND SPLIT DATA CORRELATIONS (Pearson's coefficient)

MALES ITEMS:

1. FREQUENCY OF LUCID-DREAMS / BELIEF IN E.S.P. 1, 25
   $r = 0.46$; 22 d.f.; $P < 0.05$
   Split: ($r = 0.56$; 10 d.f.; n.s.)
   ($r = 0.22$; 10 d.f.; n.s.)

2. FREQUENCY OF LUCID-DREAMS / FREQUENCY OF DAY-DREAMING 1, 27
   $r = 0.42$; 22 d.f.; $P < 0.05$
   Split: ($r = 0.38$; 10 d.f.; n.s.)
   ($r = 0.37$; 10 d.f.; n.s.)

FEMALES

1. FREQUENCY OF LUCID-DREAMS / FREQUENCY OF HYPNAGOGIC IMAGERY 1, 18
   $r = 0.56$; 22 d.f.; $P < 0.01$
   Split: ($r = 0.25$; 10 d.f.; n.s.)
   ($r = 0.74$; 10 d.f.; $P < 0.01$)

2. FREQUENCY OF LUCID-DREAMS / FREQUENCY RECALL OF NIGHT DREAMS 1, 29
   $r = 0.43$; 22 d.f.; $P < 0.05$
   Split: ($r = 0.19$; 10 d.f.; n.s.)
   ($r = 0.52$; 10 d.f.; n.s.)

3. FREQUENCY OF LUCID-DREAMS / FREQUENCY OF SEEING SELF IN DREAMS 1, 31
   $r = 0.48$; 22 d.f.; $P < 0.05$
   Split: ($r = 0.22$; 10 d.f.; n.s.)
   ($r = 0.65$; 10 d.f.; $P < 0.05$)

Split-data correlations: (N-2 degrees of freedom used).
Table values: 5%: 0.58; 2%: 0.66; 1%: 0.71.

and one item which had not, gave significant correlations. These were items: 25, 27, 29 and 32 (reported frequency of recurring dreams).

In the Table on page 275, it is clear that since there are a large number of correlations the significant ones could be statistical artefacts. Approximately 2 might be expected, per column, by chance alone (at the 5% level) which could account for the apparently significant items. Therefore it was decided to perform split-half correlations of the male and female data (i.e. subjects 1-12, 13-24). Any consistent, genuine, effect should be present in both halves. Table XV.3 on page 276 states the overall and split-data correlations. It can be seen that the split-data analyses are all dissimilar, except for the frequency of lucid-dreams/ frequency of day-dreaming correlation for males - but these correlations are not significant.Therefore, the overall correlations are not reliable.

(b) Lucid-dream phenomena questions.

A table showing these results is shown on pages 281-283. In general, compared to ordinary dreams, imagery and thinking in lucid-dreams tend to be of the same or better quality. The dreams are also more memorable. Most people (more females) report that they are neutral to pleasant experiences, happening mostly after 5 a.m. and lasting an estimated few minutes. Various visual distortions are noted by most persons in the lucid state. Time in lucid-dreams is usually reported as being like real time, or is somewhat compressed. Most persons wake from a lucid-dream and about half the sample had experienced false-awakenings to their knowledge. Most persons had not performed experiments in lucid-dreams and had not attempted to control events. Despite the fact that flying is often reported by habitual dreamers (V.3.4), most persons had not flown in lucid-dreams. Finally, most persons state that they would like to experience a lucid-dream again.

Significantly more lucid-dreams were reported by females than males. This may be a genuine sex difference but it could also simply reflect some bias in the questionnaire methodology. Perhaps males are more reluctant to disclose information about lucid-dreams - which they may think are abnormal. The same higher frequency is found in reports of nightmares by females (Feldman & Hersen, 1967). Therefore, this finding must be treated cautiously.

Although the frequency of lucid-dreams appeared to correlate, significantly, with different questionnaire items for males and females, the split-data technique of testing the correlations indicated that these associations were not reliable.

The lucid-dream phenomena questionnaire shows that the items generally concur with the picture of lucid-dreams portrayed in Chapter IV. Exceptions are: The low reported frequency of flying in lucid-dreams; the lack of experimentation in them; the lack of control over events in them. General inexperience and ignorance of the control aspect are probably effects here, in which case an older sample might provide different answers to the questions.

XV.5 CONCLUSIONS.

1. Significantly more lucid-dreams were reported by females than males, but this result is uncertain.
2. None of the questionnaire items correlated reliably with reported frequency of lucid-dreams in subjects.
3. Most lucid-dreams are of the same or more vivid quality as ordinary dreams.
4. Most persons find lucid-dreams neutral or pleasant, emotionally.
5. Most lucid-dreams occur after 5 a.m.
6. Most lucid-dreams have a duration of a few minutes or several Seconds.
7. Most persons report that their thinking in lucid-dreams is as clear as when awake.
8. Thinking in lucid-dreams is reported to be more clear than in ordinary dreams.
9. Most persons have not performed experiments in lucid-dreams.
10. Most persons have never flown in lucid-dreams.
11. Colours in lucid-dreams mostly appear to be the same or brighter than in real life.
12. Colours in ordinary dreams appear to be the same or duller than in real life.
13. Physical position of the body during sleep does not appear to be related to lucid-dreams.
14. Most people report that visual distortion of images in lucid-dreams are sometimes observed,
15. Most persons report that time seems to pass normally, or is shorter than in real life, in both lucid and ordinary dreams.

16. Most people report that they cannot control the course of events in lucid-dreams.
17. Most people wake immediately after their lucid-dreams.
18. Approximately half the sample had experienced a false-awakening, to their knowledge.
19. Most people report that lucid-dreams are more memorable than ordinary dreams.
20. Most people report that they would wish to experience a lucid-dream again.
21. An older sample, more used to experiencing lucid-dreams, might report more dream control and experimentation within the lucid-dream.

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The next Chapter takes up the possible link between cortical arousal and lucid-dreams (suggested by the previous work) and looks at personality in relation to lucid-dreams. The factor of intelligence and lucid-dreams is also considered.

TABLE XV.4

LUCID-DREAM PHENOMENA QUESTIONNAIRE AND DATA.

(11 Males, 13 Females, N = 24) (0 = Female reply, I = male reply)

1. How do lucid-dream pictures compare to ordinary dream pictures?

LESS VIVID: 000
SAME: 0000000III
MORE VIVID: 000IIIIIIII

2. What is your reaction to finding yourself in a lucid-dream?

PLEASANT: 000000000III
NEUTRAL: 00IIIII
UNPLEASANT: 00III

3. When in the night do these dreams tend to occur?

- 2 a.m. 00I
2-5 a.m. 00000I
5 - a.m. 000000IIIIIIIII

4. How long do these dreams last on average?

SECONDS: 0000IIIII
FEW MINS: 0000000IIIIII
MANY MINS: 00

5. How does your thinking in lucid-dreams compare to that of waking?

MORE CLEAR: 0III
SAME: 00000000IIIIII
LESS CLEAR: 0000II

6. How does your thinking in lucid-dreams compare to that in ordinary dreams?

MORE CLEAR: 000000IIIIIIII
SAME: 00000II
LESS CLEAR: 00I

8. Have you ever flown (under your own power) in a lucid-dream?

YES: 000II

NO: 0000000000IIIIIIIII

9. How do colours appear in lucid-dreams, compared to real life?

BRIGHTER: 0IIII

SAME: 000000000IIIIIII

DULLER: 0

NO COLOUR: 00

10. How do colours appear in ordinary dreams?

BRIGHTER:

SAME: 0000000000IIIIIIIII

DULLER: 0II

NO COLOUR: 00

11. Do you know what physical position your body is usually in when you have a lucid-dream?

BACK: 00III

FR0NT: 00I

SIDE: 0II

DON'T KNOW: 00000000IIIII

12. Do things in a lucid-dream ever appear distorted, visually?

YES: 000000000IIIIIIIII

NO: 000II

DON'T KNOW: 0

13. How does time seem to pass in lucid-dreams?

LONGER:

SAME: 00000IIIII

SHORTER: 0000IIII

TIMELESS: 0000II

14. How does time seem to pass in ordinary dreams?

LONGER:
SAME: 000
SHORTER: 000000000IIII
TIMELESS: 0IIIIIII

15. Can you control the course of events in lucid-dreams?

YES: 00000III
NO: 00000000IIIIIIII

16. Do you usually wake up from a lucid-dream?

YES: 00000000000IIIIIIIII
NO: 00II

17. Have you ever thought you had woken from a lucid-dream, or ordinary dream, only to discover later that you were still dreaming?

YES: 0000000IIII
NO: 000000IIIIIII

18. How memorable are lucid-dreams compared to ordinary dreams?

MORE: 000000IIIIIIIII
SAME: 0000
LESS: 000II

19. Would you like to experience a lucid-dream again?

YES: 0000000000IIIIIIII
NEUTRAL: 00II
NO: 0I

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CHAPTER XVI

PERSONALITY AND INTELLECTUAL CAPACITY IN RELATION TO LUCID-DREAMS

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CHAPTER XVI

XVI.1 INTRODUCTION.

Further consideration of the apparent link between cortical arousal and lucidity (Chapter VIII.4) and the findings of Chapter XIV on the importance of general stimulation in the day and the cyclicity effect, led this author to postulate that perhaps Introversion (with its supposed association with high cortical arousal) might be a personality feature of lucid-dreamers. In addition, it seemed feasible that persons with greater observational powers and intellectual capacity would be more likely to have lucid-dreams as discrepancies in the dream environment might be more readily noticed by-them. Both of these propositions are amenable to scientific investigation by appropriate psychological tests.

1/ PERSONALITY AND LUCID DREAMS

It was discovered that lucid-dreams always appeared after a REM burst (Chapter VIII.3), which presumably accompanied cortical stimulation . Thus, a possible explanation of lucid-dreams is that conscious awareness results from Spontaneous, non-specific, internal cortical-bombardment from the ascending reticular formation whilst physiologically the body is in Stage REM sleep. Meaningful external stimuli could also stimulate the cortex, via the reticula.r formation, to an extent where consciousness emerged (which was the rationale in the lucid-dream induction experiment described in

Chapter XII). In addition, the results of the experiments described in Chapter XIV indicated that a cyclicity (perhaps physiologically caused) affected the Subject's lucid-dream frequency, and that the occurred significantly more after a day of above-average stimulation. Also, subjectively, emotional and imagery aspects of the lucid-dream were dependent on the existing levels before lucidity. These factors point to the possibility of physiological aspects controlling lucidity in dreams, centering on cortical stimulation. If this conceptualisation is correct it would be expected that persons who possess a generally higher baseline level of cortical arousal will be more likely to experience lucid-dreams.

Eysenck (1965a) has formulated the law: 'Introverts are characterised by a reticular formation the activating part of which has a relatively low threshold of arousal, while the recruiting part of it has a relatively high threshold of arousal; conversely, Extraverts are characterised by their possession of a reticular formation whose activating part has a high threshold of arousal and whose recruiting (synchronising) part has a low threshold of arousal. Under identical conditions therefore, cortical arousal will be more marked in Introverts, cortical inhibition in Extraverts'.

Thus, the hypothesis may be stated that a group of persons who report having lucid-dreams will be more Introverted than a matched Control group of persons who do not report such dreams.

a. The Psychological tool:

The Eysenck Personality Inventory (EPI, Eysenck & Eysenck 19664) was devised to test the hypothetical personality dimensions of Extraversion (E) and Neuroticism (N). It was developed from the earlier Maudsley Personality Inventory (MPI, Eysenck, 1959). The EPI test is available in two forms (A and B). The 57 questions in each version are answered dichotomously (Yes/No). There are 24 of both N and E questions, and a 9-item Lie scale (L). The test has been used extensively in many areas of psychology and is a sensitive indicator of individual differences. The two dimensions of E and N are similar to Kant and Wundts' explanation of personality in terms of strength and speed of change of feelings. Such a notion permits a four-fold classification of personality types reminiscent too of that held by the ancient Greeks:

Melancholic: (High N, low E).Traits: Moody, anxious, rigid, sober, pessimistic, reserved, unsociable, quiet.

Choleric: (High N, high E). Traits: Touchy, restless, aggressive, excitable, changeable, impulsive, optimistic, active.

Phlegmatic: (Low N, low E): Traits: Passive, careful, thoughtful, peaceful, controlled, reliable, even-tempered, calm.

Sanguine: (Low N, high E). Traits: Sociable, outgoing, talkative, responsive, easy-going, lively, carefree, leadership. (Eysenck, 1964).

Support for the physiological aspect of Eysenck's ideas has come from many quarters. For instance, CNS stimulant drugs tend to have introverting effects on many experimental tests, yet CNS depressant substances have the opposite effect (Eysenck, 1963a). Generally, different groups of Extravert or Introvert Subjects respond to these drugs in the predicted direction. Shagass & Schwartz

(1963) found that Extraverts require less depressant substance to reach sedation point than Introverts. This is in line with Eysenck's hypothesis that Extraverts already have a higher level of inhibition so should need a smaller amount of the drug.

Extraversion / Introversion is supposed to be normally distributed in the population, with most people in the central 'ambivert' region of the Gaussian curve. The E score is of primary importance in this study, however N would also be compared between groups as a matter of interest.

2/ INTELLECTUAL CAPACITY AND LUCID-DREAMS:

To answer the question of whether lucid-dreamers are better observers of dream-scenery so detecting discrepancies which often trigger lucidity, and seeing relationships through advanced reasoning, Raven's Progressive matrices (Sets A, B, C, D, E) would be applied to groups of Subjects who do or do not experience Lucid-dreams. It is hypothesised that lucid-dreamers would produce higher scores than a matched Control group of persons who do not experience these dreams.

a. The Psychological tool:

Raven's Standard Progressive Matrices test (1938) is designed to compare persons with respect to their immediate capacities for observation and clear thinking. The scale is composed of 5 sets of 12 visual problems, totaling 60. The problems increase in difficulty, and their order trains the Subject in the method of working. The scale may be used by adults or children. Adults' scores tend to cluster in the upper part of the scale, but the very difficult problems allow differentiation. The problems are worked through systematically, The total score (out of 60) gives an index of the Subject's intellectual capacity. It is culture-free, and available for persons of any level of education. A 20 minute limit was placed on this test to avoid a lengthy overall test period for subjects.

XVI.2 METHOD.

Subjects:

In all, 20 persons were used in this study (10 in each group).

E group: Subjects who in a survey stated that they experienced lucid-dreams at a frequency of at least 1 per month (Subject A.W. was in this group).

C group: Subjects who reported that they never experienced lucid-dreams.

Each of these groups consisted of 5 males and 5 females so that any sex differences affecting the results could be observed.

The two groups were matched for age. As the groups were composed of University persons, intelligence and educational level would be approximately equal, though above average. It was recognised that since intelligence levels are high in both groups the hypothesized difference between groups would be only marginal.

Experimental procedure:

Members of the groups were selected from questionnaire results which had been obtained previously. E and C Subjects were visited by the E in semi-random sequence to avoid any order effect caused say by mood of the E which might influence the Subjects' responses. The E explained the tests to the Subject, then left the person alone to complete them. Two persons could not be traced, so were replaced by others using the same selection criteria. Two Subjects completed the tests on visiting the sleep-lab.

XV1.3 RESULTS.

The data were analysed (a) overall (i.e. 10 E Ss vs. 10 Control Ss), and for each sex (5 Ss in each group). Thus, 9 comparisons were made in all, using a t-test which compares means of independent samples.

TABLE XVI.1 TABLE OF RAW-DATA

	E GROUP			C GROUP			
S:	RPM	E	N	RPM	E	N	
1.	54	14	8	51	6	5	
2.	50	17	5	50	13	12	MALES
3.	46	12	18	49	18	3	
4.	49	7	8	49	14	15	
5.	52	9	9	52	17	12	
6.	43	20	16	42	4	15	
7.	54	12	14	45	15	18	FEMALES
8.	53	10	15	52	17	10	
9.	50	16	10	48	20	15	
10.	47	11	12	50	12	48	

RPM = Raven's Progressive Matrices score.
E = Extraversion / Introversion score (EPI)
N = Neuroticism score (EPI).

MEANS:

	E			C		
	RPM	E	N	RPM	E	N
M	50.2	11.8	9.6	50.2	13.6	9.4
F	49.4	13.8	13.4	47.4	13.6	21.2

t-test results:

Overall: (E vs. C) d.f. = 18.
RPM: t = 0.66 n.s.
E: t = 0.39 n.s.
N: t = 0.09 n.s.

Males vs. Females: d.f. = 8.

E group:
RPM: t = 0.33 n.s.
E: t = 0.78 n.s.
N: t = 1.55 n.s.

C Group:
RPM: t = 1.50 n.s.
E: t = 0.00 n.s.
N: t = 1.3 n.s.

XVI.4 DISCUSSION.

The hypothesised link between Introversion / extraversion and the experience of lucid-dreams was not supported by the results. Neither was the notion that persons with better observational powers and higher intellectual capacity are more likely to have lucid-dreams. However, the sample used here had a fairly uniformly high intelligence. It would be of interest to test the idea using a wider range of levels. However, the Introversion / Extraversion range was quite wide, so perhaps that finding is more conclusive.

One point telling against a personality link with lucid-dreams is the fact that several people known to the author, and indeed the author himself (page 367), who did not previously have lucid-dreams, began to do so when the concept of them had become firmly established. Probably, the capacity is potentially available for most people. How the phenomenon arises in persons is worthy of investigation. Some report they develop from a childhood ability to control bad dreams. The thought 'This is only a dream' often occurs when a nightmare is at a critical point. That may how the concept of lucidity is established in most lucid-dreamers. A conscious appreciation of this notion is obviously effective too.

This Chapter concludes the descriptions of experiments performed in this research. Part 3 gives details of certain devices that arose out of this work. A full discussion of the overall results, with speculations, conclusions and suggestions for future work is given in Part 4.

PART 3

DEVICES

GENERAL INTRODUCTION.

CHAPTER XVII. 'C.E.M.O.S.' DEVICE

CHAPTER XVIII. NIGHTMARE INTERRUPTOR DEVICE

CHAPTER XIX. LUCID-DREAM / FALSE-AWAKENING INDUCTION DEVICE.

***

GENERAL INTRODUCTION.

The subject-area of this Ph.D. study and some of the techniques involved are novel in sleep and dream research. Often, such situations provide opportunities for devising apparatus which will aid the research in some way or will be of use in other associated fields. Throughout this work, several ideas suggested themselves regarding technical devices. The incentive was nearly always to improve the efficiency of the research. Thus, for instance: lucid-dreams were scarce in the Sleep-laboratory - could they be artificially induced by some apparatus? Or, could the Subject perform home pilot-experiments by somehow switching on equipment during a lucid-dream? One train of thought concerning a device enabling one to wake oneself from a lucid-dream or state of sleep-paralysis, led to the concept of an automatic 'biofeedback'device which could rouse a person from a nightmare. It was found that nightmares are experienced by a sizeable number of persons. Therefore it is hoped this device (analagous in some ways to the enuretic alarm) will be of some use to nightmare sufferers. Three of the devices which arose from the work for this study are described in the next 3 Chapters.

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‘C.E.M.O.S.’ DEVICE

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CHAPTER XVII

‘C.E.M.O.S.’ DEVICE

XVII.1 INTRODUCTION.

A drawback of lucid-dream research is that it is rather inefficient inasmuch that the subject may not have a lucid-dream for many nights in the sleep-lab before producing one. In the 1st A.W. study for example, 8 lucid-dreams were obtained from 45 nights of continuous polygraphic recording. It would be useful therefore, from a pilot-study viewpoint, if some home experiments could be conducted. Results obtained would not have polygraphic evidence but could provide pointers for future research avenues. For instance, if the Subject, when lucid, could somehow switch on a tape-recorder, external stimuli could be played and a subsequent waking report could indicate how they are received, if at all, within the lucid-dream.

With this in mind, the author conceived the idea of the ‘CEMOS’ (Coded Eye-Movement Operated Switch) device. Since it was found that the Subject was incapable of making motor responses during lucid-dreams, ocular movements would have to be registered in order to operate a relay, via electronic equipment. Such a device has been constructed to the author’s specifications by the Workshop staff of the Dept. of Psychology. A further ability of the device is to switch on a second tape-recorder which records the first recorder’s stimuli and super-imposes ‘bleeps’ caused by ocular movements. Plainly, the Subject’s responses to stimuli can be recorded using this technique. Thus, the Subject’s state of intelligence and alertness in the lucid-dream could be determined by giving ,say, arithmetical problems, the answers to which could be signalled from the dream state.

XVII.2 DESCRIPTION OF THE APPARATUS. (Picture on page 297).

Ocular movements are monitored from electrodes placed on the skin in the vicinity of the eyes. A.C. amplification of eye-movement potentials occurs, and signals above an adjustable threshold cause electrical pulses to enter a time-switch/register which resets cyclically after a few seconds. On receiving a preset number of eye-movement pulses, the time-switch/register causes an output so activating a timer which switches on other equipment, such as tape-recorders, for a preset period. In addition, each time the time-switch/register triggers, an indicator-light operates to provide information on gain-setting and operation. Eye-movements above the adjustable threshold also cause a pulse to be output for tape-recording, as a tone.

XVII.3 COMMENTS.

Two main technical snags are preventing the operational use of this apparatus at present. The first is that the trigger threshold appears to be too fine. Secondly, the level seems to vary during the course of the night - presumably due to component heating. The latter problem might be overcome by leaving the device permanently switched on, so that an equilibrium point is attained. Further endeavours are being made to make ‘CEMOS’ function satisfactorily.

A recent idea is to link the unit to a respiratory thermistor, so making a ‘respiratory-operated.-switch’ (ROS).

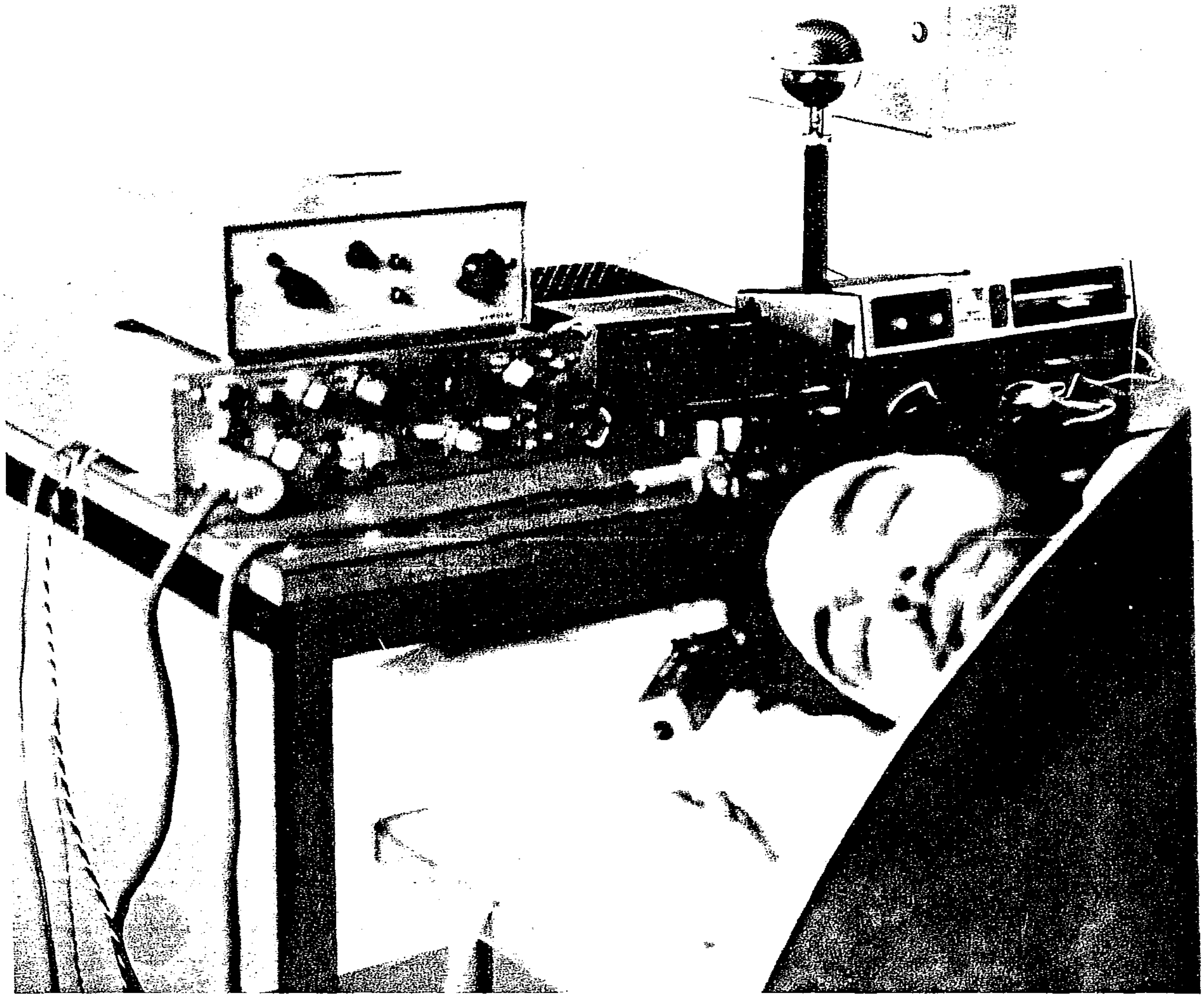

FIGURE XVII.1

SUBJECT WIRED UP TO ‘C.E.M.O.S.’ EQUIPMENT

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CHAPTER XVIII

NIGHTMARE-INTERRUPTER DEVICE.

(Provisional patent: 32618 /77)

XVIII.1 INTRODUCTION.

It occurred to the author that CEMOS could be employed as a feedback device to wake a person from a nightmare in which lucidity was present, or from a state of sleep-paralysis (where the sufferer is conscious but REM atonia persists). On receipt of the requisite number of ocular signals the device could sound an alarm to wake the subject and, say, switch on a light or cassette-tape of pleasant music to calm the person. On further reflection it was considered that a better method would be to monitor some physiological concomitant of ordinary nightmares which would trigger when a certain level of activity registered. Such an apparatus would have a greater utility.

A review of the literature on nightmares was conducted in order to ascertain: The extent of the problem, a clear picture of the phenomenon, which physiological measures accompanied nightmares recorded in sleep-laboratories, and any other factors involved including alleged causes. It was discovered that nightmares are experienced by a surprisingly large number of people (Where a nightmare is defined as a frightening dream that awakens the dreamer). Estimates vary and are probably under-estimates since persons may not wish to admit to having them.

Feldman & Hersen (1967) found 5% of undergraduates reported at least one nightmare per week. Hersen (1971) obtained a figure of 7% for a psychiatric population for the same frequency. Females admit to having more nightmares, perhaps due to greater fearfulness than males, though they may

be more honest than men in their reports. These figures could then mean that some 3 million people in Britain experience nightmares at least once a week. Further, on any night in this country over 400,000 persons have a nightmare.
The scope of the suffering is enormous and probably largely unrecognised. Possibly, too, most sufferers do not seek help about this problem for fear of being labelled a psychiatric case. Clearly, any device that might alleviate the problem would be of benefit to mankind.

There appear to be three types of nightmare:

1/ Stage 4 nightmares. (The 'incubus' attack)

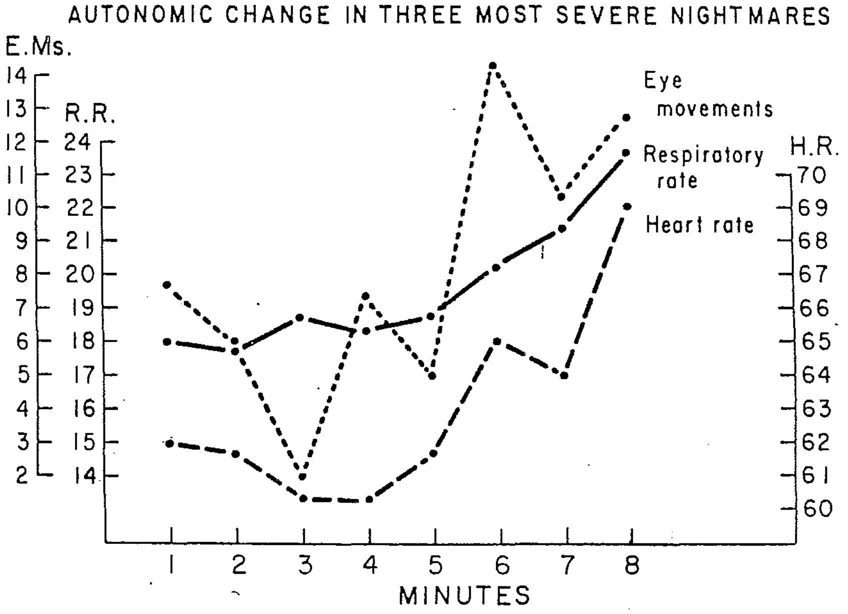
These are very rare, constituting 4% of nightmares in Subjects who complain of nightmares (Fisher et al., 1970). Typically the Subject wakes very suddenly from calm Stage 4 sleep in the first half of the night. A severe arousal reaction occurs at that point, with tachycardia and, hyperpnea. The Stage 4 nightmare is somewhat similar to 'pavor nocturnus' (night-terror) in children. Gastaut & Broughton (1965) and Broughton (1968) suggested that these states (and other disorders such as enuresis, somnambulism and bruxism) are disorders of arousal rather than sleep. There is no increase in physiological measures before the event, although a slight decrease in respiration and heart-rate was observed by Fisher et al., (1970). Interestingly, the greater the decrease the more intense the nightmare. A similar correlation was found for the amount of Stage 4 preceding the nightmare i.e. the more Stage 4 the worse was the nightmare. All 7 subjects in that study had been 'heavily traumatized' at some time in life. Most had witnessed much violence in the home during early childhood. For these Subjects
in fact a Stage 4 nightmare could be precipitated by a loud external stimulus,

stimulus, such as a buzzer. (Perhaps such sufferers should use ear-plugs during sleep in order to reduce external stimulation, or wear ear-phones playing gentle music or some masking noise). It is interesting that REM content between these Stage 4 attacks does not appear to be unduly stressful (Fisher et al., 1970.)

2/ Stage REM nightmare.

The great majority of nightmares are anxiety dreams occurring in Stage REM sleep. These are often preceded for several minutes by an increase in heart-rate, eye-movements and respiratory rates (See figure below from Fisher et al., 1970).

FIGURE XVII.1

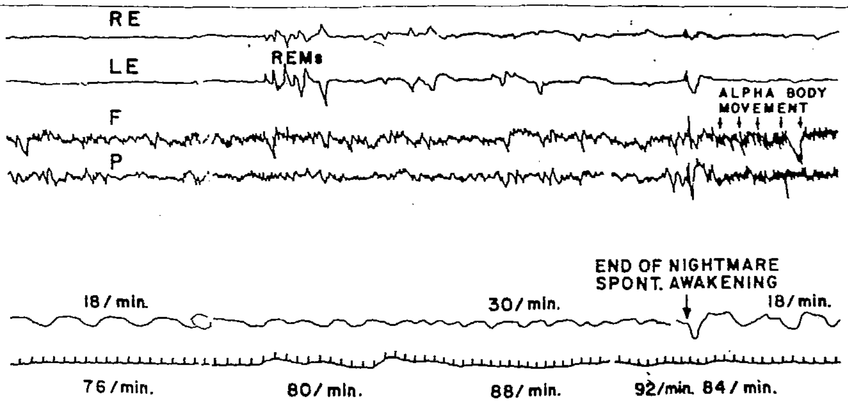


This figure shows increase in heart rate, respiratory rate, and number of eye movements during the terminal anxiety of the three most severe REM nightmares. The graph shows the last eight minutes of the REM period before arousal.

Hartmann (1970) reported that the REM nightmare is usually manifested after a long and active REMP, when D-pressure (the physiological need of REM sleep) is maximal.

Probably, in a home situation these dreams are more frightening, since in the sleep-lab the knowledge that someone is nearby could exert a generally calming influence on the dreamer (Fisher et al., 1970, Broughton, 1968.). Thus, probably more often than not physiological concomitants are present during the development of the nightmare as well as afterwards on waking. An example of a polygraphical record of a Stage REM nightmare is shown below (From Fisher et al., 1970):

FIGURE XVIII.2



Subject A. REM anxiety dream showing increase in heart and respiratory rates preceding arousal associated with frightening content.

3/ Stage 2 nightmares.

A few nightmares have been recorded from Stage 2 sleep (Fisher et al., 1970). They are of intermediate severity between Stage 4 and Stage REM varieties. Like the Stage 4 kind though, they are not preceded by raised physiological levels, and they occur in persons who also have Stage 4 nightmares.

Contradictory findings have resulted from attempts to correlate personality factors with the frequency of reported nightmares. Feldman & Hersen (1967) found a positive link between fear of death and nightmare frequency. Hersen (1971) observed the same in a psychiatric sample, Lester (1968) however, replicating Feldman & Hersens' work, did not find such a link, but the questionnaire used was different and only female subjects were used. Also, the criteria for the frequency categorization were different. In another, subsequent, study by Lester (1969) the correlation again failed to appear.

Hersen (1971a) studying psychiatric in-patients stated that nightmare sufferers exhibited greater manifest anxiety, lower ego-strength and significantly more sleep disturbances. Gastaut and Broughton (1965) found that 4 of their 6 Subjects evinced irritability and anxiety in the day whilst the other 2 were diagnosed as anxiety neurotics. In the case of pavor nocturnus, Kanner (1957) suggests a generalized psychopathology in the child. On the other hand Gastaut & Broughton (1965) stated that daytime anxiety is rare in children with night-terrors.

Various theories have been propounded to explain the cause of nightmares. Physiological homeostatic imbalance can lead to them. Grob et al., (1947) found that daily intra-muscular injections of di-isopropyl fluoro-phosphate (a potent anti-cholinesterase) results in nightmares. Similarly, Gross and Goodenough (1968) found that in acute alcoholic psychosis following initial addiction, there is decreased sleep and an increased frequency of nightmares. Withdrawal from alcohol and barbiturates (sleeping tablets) after tolerance is established, results in 'REM rebound' associated with very severe nightmares (Oswald, 1968; Oswald & Priest, 1965). It is this effect which keeps many people addicted to drugs. In this respect it should be noted that Hartmann (1970) associated the presence of nightmares to REM or D-deprivation. He also stated that nightmares occur in the recovery period from febrile illnesses, when REM sleep is reduced (Karacan et al., 1968).

Hartmann also reported a case of a female who had a nightmare just before onset of menstruation - a time of increased D-pressure (Hartmann 1966). No empirical evidence yet exists though to definitely signify a link between D-pressure and nightmares.

From the psychological point of view nightmares have posed a problem to the conventional psycho-analytical idea that dreams represent disguised wishes and that their function is to guard (i.e. maintain) sleep (Freud 1900, 1961). Jones (1919) believed that the nightmare is an anxiety attack that 'is always an expression of intense, mental conflict centering about some form of 'repressed' sexual desire'. Thus, from the psycho-analytic standpoint nightmares suggest a neurotic personality. This approach rests on the medical model i.e. that the nightmare can be traced to a specific cause (which is linked to a sexual or aggressive conflict). However, behaviour therapy , utilising learning-theory, has been used successfully to treat Subjects with nightmares - without uncovering any alleged ancient 'cause'. Further, these Subjects appeared to be free from other neurotic tendencies (Geer & Silverman, 1967; Silverman & Geer, 1968).

Wolpe's (1958) method of de-sensitization has been applied by Geer & Silverman and also Cautela (1968). The subject may, for instance, be taught deep-relaxation and is then instructed to visualise stressful dream sequences during which the self-instruction 'It is only a dream' occurs accompanied by relaxation. Nightmares have been extinguished after several sessions.

Behaviour therapy has also been employed to treat the particular fear of something experienced within a nightmare. Thus, Silverman & Geer (1968) systematically desensitized a female having a phobia of heights and hence cured nightmares in which she was often high up off the ground.

The success of behaviour modification techniques in controlling nightmares leads one to suppose that a device could be used to detect the physiological accompaniments of the nightmare and so waken the sufferer at an early stage before the feeling of fear is very great. There is obviously no psychological need to, say, ‘release energy’ via the event. Such a device would be analogous to the enuretic alarm apparatus.

The main advantage of a nightmare-interruptor device would be to break down the general fear of sleep. The subject would feel safe that rousing would occur before the nightmare was too advanced. It would be useful too for cardiac patients with nightmares since the strain on the heart during a nightmare can be considerable.

Medically, Stage 4 nightmares have been treated with encouraging results by Diazepam (Valium) which suppresses Stage 4 sleep (Kahn et al., 1970). The suppression of Stage REM and those nightmares by, for instance, MAO-inhibitors is obviously an extreme step.

XVIII.2 DESCRIPTION OF THE DEVICE.

Essentially the device would monitor a physiological concomitant of stress in the dream and trigger an alarm or other apparatus when a certain pre-set level was attained. Experience with electro-physiological recording equipment dictated the choice of a nasal thermistor, measuring respiratory rate (i.e. the temperature differential between inspired and expired air). Such a system has the advantage of being artefact-free. Electrode systems generate false transients when the Subject moves. The nasal thermistor could attach by means of a simple clip.

XVIII.3 PROPOSALS.

A local firm (Rrodsham Automation Co. Ltd., of Bridge Lane, Frodsham, Cheshire) became interested in the device and have constructed a prototype which appears to function satisfactorily. A picture of the device is on page 307. It is intended to conduct trials by testing its efficacy on chronic nightmare sufferers. A Control , placebo, device should also be administered to another group of Subjects. The amount of placebo effect and the actual usefulness of the method should then be established. A suitable baseline for both measures would be observation of the frequency of night-mares over a period of time in untreated Subjects.

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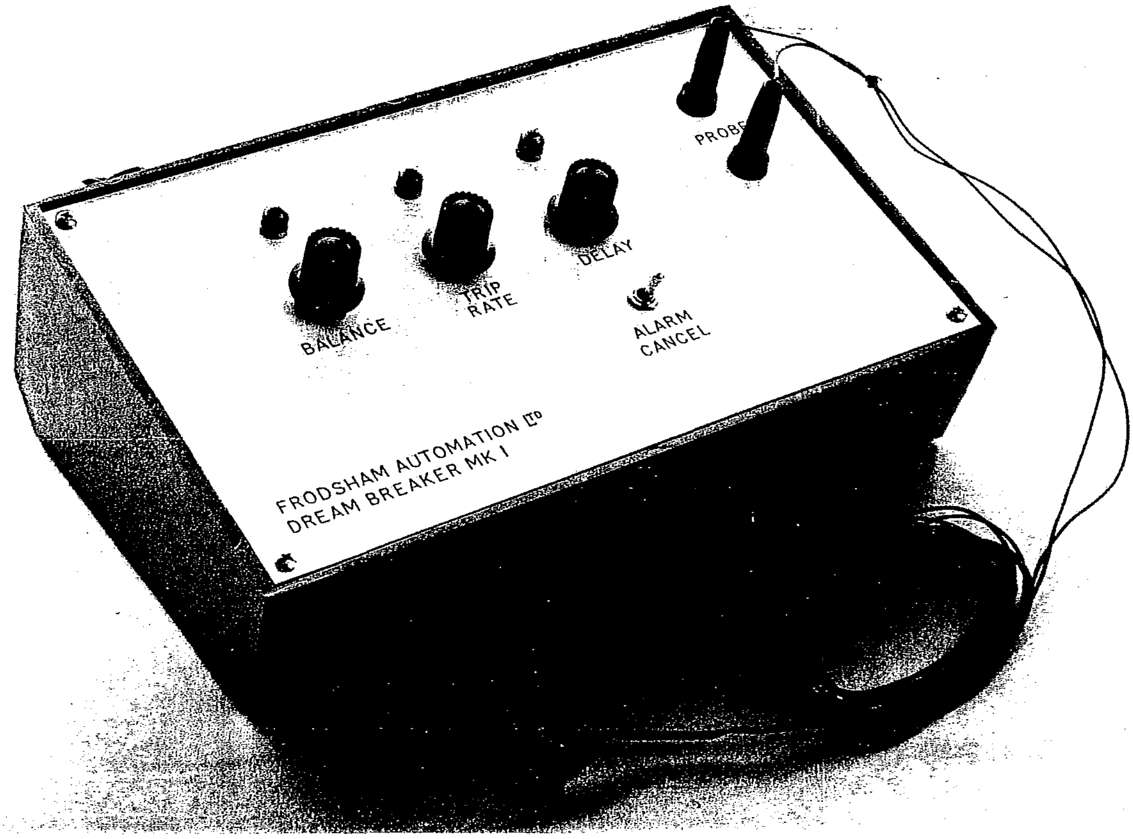
PROBE
BALANCE
TRIP
RATE
DELAY
ALARM
CANCEL
FRODSHAM AUTOMATION LTD
DREAM BREAKER MK I

FIGURE XVIII.3

CHAPTER XIX

LUCID-DREAM / FALSE -AWAKENING INDUCTION DEVICE

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CHAPTER XIX

LUCID-DREAM / FALSE-AWAKENING INDUCTION DEVICE.

(Provisional patent: 13880/78).

XIX.1 INTRODUCTION.

Koulack (1969) reported that electrical stimulation of the wrist was incorporated into dreams to a large extent, and appeared not to waken Subjects. This author had the idea that if a Subject were psychologically 'set' to receive and comprehend such stimulation, the perception of shocks in a dream should precipitate a lucid-dream. In the few trials that have been conducted so far on a single subject, only false-awakenings have resulted (Chapter XIII). However, it is anticipated that the device will produce lucid-dreams eventually in this Subject. The device could be useful not only to sleep/dream researchers in the sleep-lab, but also to persons wishing to experience these phenomena at home. To this latter end an envisaged system is described here.

XIX.2 DESCRIPTION OF THE DEVICE.

The device is intended to induce 'lucid-dreams' (van Eeden, 1913; Green, 1968) and/or 'false-awakenings' (Green, 1968) in persons. Initially the user establishes the psychological concept, when awake, that if a particular stimulation occurs in a dream it is intended to make the person aware that the experience at that time is a dream. Consciousness is thus established in the dream. Mild electric shocks have been found to be registered in dreams (Koulack, 1969). Thus, the device consists of a timer which is linked to electronic circuitry which causes a sequence of electrical pulses to be output after any variable time delay period, which can also be cyclical. The pulses are fed to a transformer which produces a high voltage output to electrodes placed on the person's skin. Some of the stimulation periods would, by chance, coincide with Stage PEM sleep , associated with lucid-dreams (Hearne, 1978).

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PART 4

DISCUSSION & CONCLUSIONS

CHAPTER XX. DISCUSSION AND SPECULATIONS

CHAPTER XXI. CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH.

CHAPTER XX

DISCUSSION AND SPECULATIONS

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CHAPTER XX

DISCUSSION AND SPECULATIONS.

XX.1 SURVEY OF THE FINDINGS.

The relative low availability of Subjects and the apparent inhibitory effect of the sleep-laboratory situation on the production of lucid-dreams have made the electro-physiological data in this Study hard won. Extensive information has been collected from subject A.W. and a Stage REM lucid-dream phenomenon has been demonstrated. However it is not known at this juncture to what extent these findings can generalise to other Subjects. The 'lucid-dreams' of subject A.C. (Chapter X) do not seem to be typical examples (Chapters V and XV) in that lucidity is brief. Nevertheless, a technique has been employed successfully here which will enable further studies to be made.

The method of signaling from Stage REM sleep by pressing a micro-switch (III.8) may or may not be possible. This author is doubtful that it can occur in phasic REM. Subject A.W. was not apparently able to operate such a device in that Stage of sleep. That is why the method of ocular signaling was tried and found to work satisfactorily. Since there is also evidence that respiratory movements can be voluntarily controlled in Stage REM (Chapter XIII), this technique too might be used with or instead of ocular movements in future. Both methods are slow though, so codes representing longer messages will probably be necessary. The very fact that deliberate ocular-signaling can occur in Stage REM is relevant to the 'picture-scanning'
notion on REMs (page 138): such movements are possible0 However,
this author does not believe that all REMs are volitional ; some

could be due to PGO activity. As Oswald (1962) pointed out, some are too gross to be scanning movements.

The 1st A.W. study (Chapter VIII) did reveal much information on where in sleep lucid-dreams occur, in subject A.W. It had been assumed that they would constitute a phenomenon of Stage REM sleep (Green, 1968). However, from a theoretical view-point it may be that there exists another form of 'lucid-dream'. hypnagogic or hypnopompic imagery (III.9) occurring before sleep or on waking in the night or morning might be indistinguishable from Stage REM lucid-dreams in some subjects with good imagery. This could account for 'lucid-dreams' reportedly occurring at surfacing in sleep, and those reported at sleep onset (e.g. those of Ouspensky, Chapter III).

The lucid-dreams of subject A.W. were confirmed to be stage REM events. Their mean duration in the sleep-lab was very similar to the Subject's mean estimation of his home lucid-dreams. They were embedded in a REMP lasting several minutes (mean 24) and tended to occur between 5 and 8 a.m. This latter point ties in with van Eeden's report that his 300 recorded lucid-dreams 'always' occurred within those hours. The sleep patterns of lucid-dream nights and control nights showed no significant differences, so lucid-dreams are not the products of light or disturbed sleep.

A totally unexpected result was that when lucidity did occur, it was invariably after a REM burst (page 153). It is therefore apparently dependent on cortical stimulation which is presumably a concomitant of PGO spike activity - which may also cause REMs (page 84). That finding hinted that physiological factors may be of some importance in the establishment of awareness within the dream, and other aspects of the dreams. Another example

example of possible physiological control in the discovery that heart-rate in the lucid-dream is positively correlated with the length of the pre-lucid REM burst. If the psychological/emotional activities are in fact 'driven' by physiological level, the lucid-dreamer may be conceptualised as a kind of 'puppet' keeping pace with the 'music' (physiological level). The emotionality of ordinary dreams may be similarly programmed. Other indicators that physiological factors may influence lucid-dreams was found in Chapter XIV. A frequency cycle of 4 days affected one-quarter of the sample of lucid-dreams. Most likely perhaps, that represents some physiological rhythm. In addition, the finding that lucid-dreams tend to occur after days of greater than usual stimulation could accept a similar interpretation. Although in this case it is ambiguous in that more psychological activity in dreams may also be initiated , which might 'trigger' lucidity. The hypothesized link between Introversion and lucid-dreams , based on a physiological notion, was not substantiated though. Neither was the postulated association between intelligence factors and lucid-dreams. Whilst it seems likely that physiological processes determine when lucidity appears in dreams, actual initiation, may be psychological - in that, for instance, discrepancies in the dream environment would be observed and cause awareness to emerge (although this too might be a rationalisation and in fact lucidity is directly caused by physiological stimulation of the cortex). What happens in the brain at that moment is open to conjecture. PGO spikes may raise 'critical awareness' to some crucial point at which consciousness appears within the dream, or perhaps memory circuits (which include information on the person's self identity and recent history), normally disconnected in REM, may be activated.

The results from the 1st A.W. study relating subjectively reported experiences in the lucid—dream to the ocular signals as recorded polygraphically, are revealing (Chapter IX). The notion that dreams are very transient phenomena (page 184) is, in the author's experience, an extremely popular. The experiment of Dement & Wolpert (1957a) where external stimuli were linked up with dream reports and showed apparent temporality corresponding to real time, provided evidence against that idea. However the possibility remained that the stimuli were 'stored up' and a compressed dream occurred on waking. The polygraphic recordings of ocular signals in the dream corresponded to a large extent to the Subject's post-lucid-dream report. Any discrepancies could be accounted for by the ordinary limitations of short-term-memory which would apply when awake too. The Subject reported that lucidity was usually continuous in the dream and any lapses were recognised. The continual signaling in lucid-dream A (page 171) indicates that his assertion is correct.

On the topic of memory in lucid-dreams, recent waking memories are present apparently as the subject remembers pre-sleep instructions (and in his home lucid-dreams his previously worked out experimental plans for the dream). That circuitry does not appear to be 'shunted out' (page 85) during lucid-dreams. One wonders to what extent material could be learnt and recalled in lucid-dreams and how efficient the process would be compared to the waking state (see page 333).

The Subject appeared to be able to think coherently when lucid and could concentrate on signaling correctly.

Although the Subject, on several occasions, believed he had pressed the micro-switch, this was illusory - as was the sound of its operating 'click' (which the Experimenter would also have heard over the sensitive inter-corn system). Similarly his 'running commentaries', were nothing of the sort. However, because his ocular movements occurred one may assume that the other activities did too at a brain 'command' level, but that muscular inhibition (page 25) prevented their execution.

Ordinary dreams are the most frequently reported vehicle of ESP mediation, accounting for 65% of reported cases of spontaneous ESP experiences (Rhine,1962). The work on dream telepathy (Ullman et al.,1973) has lent some support to the idea that dreams may contain extrasensory material.
One should imagine then that lucid-dreams are the ideal state to receive such information since the person is in the particular state of REM sleep and is aware of the situation. That may be so, but the very small-scale experiment performed in this study showed that the lucid-dream is not noticeably conducive to telepathic receptivity.

The record of flying, delineated by ocular signals before and after (page 204) reveals to the eye of this author at least that the EEG appears different during that period. Here is the first ever specific dream activity marked in the polygraphic record by the subject. The technique could possibly be of great importance in future work since if dream activities have particular EEGs, on-line computer analysis might reveal the dream content, at the time (see also page 333).

The scarcity of lucid-dream Subjects in this Study was in the author's opinion due to lack of financial remuneration for the Subjects. A sleep experiment usually requires a major temporary reorganisation of a person's life, and not many people are willing to do this repeatedly without payment. Unfortunately, of those Subjects (Chapter X) reporting frequent lucid-dreams who did participate, some first-night effect seemed to inhibit these dreams, On the hand of course, Subjects may have exaggerated their frequency of these dreams somewhat. Subject A.C.'s lucid-dreams differ from those of A.W. and most other persons who report lucid-dreams (page 281) as lucidity is usually brief.

In addition, this Subject's lucid-dreams were reported to occur in early or mid-sleep period whereas for most persons they occur later (page 281). In this Subject, lucidity appeared suddenly at the start of a REMP, very soon after the last k-complex of the preceding Stage 2. This happened on 2 recorded occasions, but movement artefact is present in one record. One other set of ocular signals were monitored from Stage REM sleep, some 11 minutes into a REMP.

The results of the experiment using simulating control Subjects attempting to produce ocular signals with a REM EEG, countered the possible objection that subject A.W. (and later Subject A.C.) was faking these measures. Demand characteristics (page 127) were present in the Experimental situation so he may have behaved in a manner to validate the Experimenter's hypotheses. However, the simulators could not reproduce the same results. Also, had demand characteristics made the subject fake the eye-movement signals, presumably the same would have applied for the micro-switch signals, as both modes of communication were suggested to the Subject.

If lucid-dreams could be artificially induced in persons, sleep-laboratory research into them would be greatly assisted. Also, since lucid-dreams enable persons to experience an immense variety of dream-situations, some of awesome beauty (as some of the dreams reported in Chapter IV testify), they could be used as a new form of recreation.

The first attempt to induce lucid-dreams (Chapter XII) using a water-spray technique was not at all successful. However, it should be borne in mind that the experiment was necessarily limited to 1 adaptation night and 1 experimental night. This method may in fact be quite adequate, given enough time. A long-term study on dream-stimulation is required. The second method tried on a small scale (Chapter XIII and Chapter XIX), which involved electric shocks to the fore-arm, gave promising results, although only false-awakenings occurred. One interesting question is whether lucidity can be maintained for long periods by repeated 'reminder' stimulations.

Two-way communication (Chapter XIII) was found to be more difficult than originally anticipated, mainly because lucidity tended to change to false-awakening situations, which confounded the experiment. Olfactory stimuli were employed so as not to risk waking the Subject in the valuable lucid-dream period. However, on an occasion when stimuli were applied, the Subject did not perceive them. The whole question of stimulation in dreams perhaps needs to be re-investigated. Perhaps stimuli are not incorporated in phasic REM, but are in tonic REM or on slight rousing from that state. It is odd too that on one occasion the Subject thought he could hear his own breathing rate, but he did not hear a loud clock near the bed.

Perhaps external stimuli are received at a low cortical level, but that the stimulus is experienced as an hallucination. In that case, if the Subject is led to expect a particular stimulus (e.g. water-spray), any other form of stimulation (e.g.touching the skin, or perhaps even a noise) might cause a dream of water, and will not be related to the actual stimulus.

The lucid-dreams of the 2nd A.W. study (XIII) were significantly shorter than those of the 1st study. Presumably the experimental tasks caused this effect in some subtle way (see page 242). Therefore, the aims of that study (2-way communication; respiratory-rate experiment; lucid-dream induction experiment) were thwarted somewhat. Nevertheless, many interesting and promising notions arose from that work.

The post-lucid-dream questionnaire pointed to interesting subjective consistencies concerning several aspects of the lucid-dreams of subject A.W. Essentially, the findings were that imagery brightness and clarity were unchanged after lucidity, but that the emotional level and clarity of thought increased (Chapter XIV). Green (1968) reported that psychological realism is usually of high quality in lucid-dreams, but in A.W. the dream was reported to be more bizarre after lucidity, in general. However, the greater insight and observational powers of that state, enabling the perception of inconsistencies, etc.) could perhaps explain that paradox.

The questionnaire information derived from a large number of Subjects who reported experiencing lucid-dreams (Chapter XV) was an attempt to discover any links between frequency of lucid-reams and several imagery and sleep phenomena. Significantly more females than males reported lucid-dreams, but as was pointed out (page 278), this finding is tentative, as sex-differences in reporting could have biased the responses. Several correlations appeared at first to be significant, but split-half analyses deflated most of these. Probably most were spuriously significant values engineered by chance. The lucid-dream-phenomena questionnaire (Chapter XV) demonstrated some discrepancies between the typical lucid-dream behaviour as reported by Green, 1968 (Chapter V). Thus, according to her, flying is a characteristic phenomenon of lucid-dreams. However, only a minority of the surveyed Subjects had flown. Similarly, most had not experimented in lucid-dreams and few had tried to control the course of events and content of the dream. Almost certainly perhaps, these differences are due to the sample consisting of young persons whereas most of the lucid-dreamers Green cites had years of experience of these phenomena. Probably, only the concept need be established in the Subject that such experiences are possible for them to occur. This author was able to manipulate his first lucid-dream by knowing that such activity was feasible.

As regards the inventions, the CEMOS device when perfected could enable various pilot-studies to be performed at home, before expensive and time-consuming sleep-laboratory experiments are initiated - that would be its main value. The nightmare interrupter equipment could potentially prevent much psychological suffering in those who experience frequent nightmares. Perhaps 1 million people in this country U.K.) alone have nightmares several times a week. This author considers that the lucid-dream/false-awakening induction device holds great promise for the future in that it could enable these phenomena to be produced on demand in the sleep-laboratory, and too, the device could be made available to the general public as a new mode of recreation. (Chapters XVII-XIX).

One further point here is that, as was discussed in Chapter IV (8), dreams have great potential as regards creativity. A lucid-dream induction device could perhaps be utilised as an aid to design, composition and invention in both Art and Science.

XX.2 OTHER POINTS AND SPECULATIONS.

IS THE SUBJECT MERELY DREAMING HE OR SHE IS LUCID?

From an experiential point of view lucid-dreamers are convinced they are lucid at the time: This author would concur from his own experience. The question is related to Freud's assertion (page 69) that the dreamer does not actually perform judgment or calculations, for instance, in dreams. The important underlying dream thought would be that a judgment had been made, or a calculation performed. However, the situation in the lucid-dream is that the dreamer patently does make ocular signals - the Subject does not merely dream they are performed. One may therefore perhaps parsimoniously assume that other dream activities and thoughts do really occur and that Freud was wrong.

WHAT CAN BE CONCLUDED FROM THE REPORTED FACT THAT MUCH OCULAR SIGNALLING DESTROYS IMAGERY IN DREAMS ?

Subject A.W. has reported this phenomenon on several occasions. It is an important observation since it affects dream theories which treat dream imagery as mere refuse spewed-out in some updating process (e.g. Evans and Newman, 1964). If the imagery were irrelevant, eye-movements should not destroy it at that time or afterwards. The observation supports the notion that dreams are of psychological origin. One other comment that may be proposed is that the REMs of ordinary Stage REM sleep may also break up imagery rather than indicate the experience of imagery.

DOES A CONTINUUM OF LUCIDITY EXIST?

Lucid-dream Subjects report that lucidity may be exceptionally clear on some occasions, yet only minimal on others. One might say a 'tunnel consciousness' affects the latter state. Probably a continuum of lucidity exists. Even when one is very clear-minded in lucid-dreams, important things can be stupidly forgotten. The study of what is not recalled in lucid-dreams could perhaps give much information about memory processes (see page 333).

WHY IS THERE NOT TOTAL CONTROL IN LUCID-DREAMS?

Subject A.W., for instance, having experienced lucid-dreams for over 20 years, has not mastered complete control over these dreams. One explanation might be that the dream is autonomous and so control is 'fought for' with the dreamer's consciousness. Or, perhaps the dream is limited in some way to progressing along certain associative pathways, within limits (e.g. of 'brightness' of imagery - hence the reported inability of some people to switch on lights in dreams - see page 243). Therefore, control might act indirectly and the effect may be delayed as a consequence.

WHAT ARE THE EFFECTS OF ALTERING 'VISUAL INPUT' IN LUCID-DREAMS?

Subject A.W. reports that any deliberate attempt to cut off 'visual input' (i.e. dream imagery) by, for instance, placing one's (dream) hands over the eyes, results in a sudden change of scene or an illusion of waking (i.e. false-awakening, see page 113). It should be noted that the logical expectations of wakefulness are maintained in the lucid-dream in that the hands are not really over the eyes, but the scene goes dark. The question arises as to why the phenomenon occurs. This author would suggest two possible answers. Firstly, perhaps imagery is produced by periodic (phasic) PGO activity which may then continue along associative lines in tonic REM. Phasic imagery may be random and might overpower any tonic imagery which may be present. (In the case of placing hands over the eyes, the seeing of blackness is presumably an act of imagery). Thus, the possibility exists of the dream containing 2 types of imagery - phasic and tonic. Secondly, there could exist some 'pressure' towards a certain level of activity or stimulation in dreams. Any volitional attempt to block this process in a lucid-dream e.g. covering the eyes, would be countered by spontaneous imagery or defence e.g. false-awakening. This idea might be supported by another reported characteristic of lucid-dreams which is that sometimes attempts to switch on a light when the imagery is dim, result in some apparent malfunction of the lamp. Subject A.W., the author, and several other persons have experienced this phenomenon.

CAN THE STUDY OF LUCID-DREAMS INTRODUCE A NEW METHOD OF STUDYING CONSCIOUSNESS ITSELF?

In Stage REM, one is asleep and unconscious, but critical awareness can appear instantly at the onset of lucidity. This is achieved without behavioural, awakening, the signs of which might normally mask the subtle 'switching on' of lucidity. Therefore, an electro-encephalographic study of the brain at such moments might indicate whether specific brain areas are associated with consciousness.

HOW DO THE EXERIMENTMAL RESULTS AFFECT PHILOSOPHICAL NOTIONS OF DREAMING?

Malcolm's (1959) criticisms of the association of dreams with Stage REM sleep are somewhat shaken by this work. It is possible for a person to think and perform actions (signals) in dreams. A sleeping and dreaming person can assert that he or she is asleep and dreaming. Total collapse of Malcolm's viewpoint is expected on the demonstration of 2-way communication studies involving evidence of reciprocal mental activity in lucid-dreams.

DOES LUCIDITY IN DREAMS REPRESENT SOME EARLIER EVOLUTIONARY STATE OF WAKING CONSCIOUSNESS?

It is conceivable that the mental state of lucid-dreams reflects the conscious state of primitive man or ape. Thus the lucid-dream may justify an evolutionary 'fossil consciousness'. It would be interesting to observe whether any universally reported 'archetypal images' could be produced volitionally in lucid-dreams.

CAN LUCID-DREAMS BE OF THERAPEUTIC VALUE?

The author knows of one middle-aged woman who experienced very severe nightmares. After hearing an account of lucid-dreams on the radio, the woman was able to control the next nightmare (and in fact make the dream pleasant) when a memory of the broadcast appeared, no doubt by association, in the nightmare. In Chapter XVIII the figure is stated that on any one night in this country (U.K.) at least 400,000 persons experience a nightmare. Some of these could be transformed into neutral or pleasant dreams using dream control.

HOW WELL HAVE THE ORIGINAL AIMS OF THIS RESEARCH BEEN MET?

The basic aim (Chapter I), to achieve communication from within the lucid-dream to the outside world, has been achieved and the new technique has provided a wealth of original information concerning lucid-dreams, at least in one Subject. Some unexpected results have formed the basis of a new conceptualisation of these dreams as being, to a large extent, dependent on physiological factors.

The difficulty of obtaining suitable Subjects, willing to return to the sleep-laboratory several times, was not appreciated at the start, although this should not necessarily be a problem for adequately-funded future research. Hence, the results are in need of generalisation to other lucid-dream Subjects.

Although the planned artificial induction of lucid-dreams by the original method was not successful, the later method of electrical stimulation gave more interesting results.

The intended questionnaire survey attempted to link various imagery and sleep phenomena to lucid-dreams, but largely without success. Nevertheless that constitutes a finding in itself.

It is hoped that the inventions from this research, which it was anticipated might result, will be of benefit to future sleep and dream researchers, and to the public at large.

CHAPTER XXI

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

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CHAPTER XXI

XXI.1 CONCLUSIONS.

Chapter VII:

1. A technique of signalling from lucid-dreams using ocular movements was found to be feasible, whereas muscular activity of the hand was found not to be possible.

Chapter VIII.

Using the same subject it was concluded that:

1. The lucid-dreams all occurred in Stage REM sleep.
2. Lucidity always occurred within 5 seconds after a REM burst.
3. The mean duration of the lucid-dreams was 133 seconds.
4. The lucid-dreams occurred between 2.32 and, 9.04 a.m.
5. No difference was found between the sleep patterns of lucid-dream and non-lucid-dream nights.
6. Heart-rate in the lucid-dream was related to the length of the pre-lucid REM burst.
7. The amount of REM activity in the lucid-dream depended on the latency of the lucid-dream into that REMP.
8. A link was found between the preceding amount of Stage 4 sleep and the duration of the lucid-dream.
9. Lucid-dreams did not occur in more disturbed REMPs than ordinary dreams.

Chapter IX. From the same subject it was concluded that:

1. The temporal order of signalled information in lucid-dreams largely corresponds to that reported on waking. Some temporal anomalies occur occasionally.
2. Time estimation of the duration of lucid-dreams is good.
3. Coherent thought is possible in lucid-dreams.

4. External stimulation might be incorporated into lucid-dreams.
5. Telepathic ability was found not to be a feature of lucid-dreams.
6. Pre-planning (before sleep) may have automatically set the lucid-dream scene.
7. External stimulation may have been incorporated into a false-awakening.
8. Possible symbolic references to the experimental situation were noted.
9. The Subject he was lucid throughout the dream on one occasion by signalling continually.
10. Recent waking memories seem to be available in lucid-dreams.

Chapter X.

1. Subjects reporting frequent lucid-dreams were found not to produce the expected number, overall, when tested - mostly for one night - in the sleep-laboratory.
2. Deliberate ocular signalling was also found possible in another Subject.

Chapter XI.

1. Simulating Control Subjects could not reproduce ocular signals with a REM EEG on waking from Stage REM sleep.

Chapter XII.

1. It was found not possible to induce lucidity in persons by water-spray stimulation in Stage REM sleep.

Chapter XIII. (Subject A.W.)

1. A 2-way communication technique involving olfactory and auditory stimulation of the subject proved inconclusive.
2. The Subject was able to mark specific dream activities in the polygraphic record using ocular movements.

3. The Subject appeared to be able to alter his breathing rate voluntarily in a lucid-dream.
4. Electrical stimulation of the fore-arm initiated false-awakenings on 2 occasions.

Chapter XIV. (Subject A.W. data).

1. A degree of cyclicity was found in the Subject's reported lucid-dreams (25% showed a k4-day rhythmicity).
2. Lucid-dreams occurred on all days of the week without apparent significant bias.
3. Lucid-dreams were found to occur more often after a day of above average stimulation (i.e. more non-routine activity or emotional events).
4. Specific events the day before, did not seem to be linked with lucid-dreams that night.
5. Subjective brightness and clarity of the dream imagery remain the same after lucidity as before.
6. Subjective clarity of thought, emotionality and bizarreness in a dream increase significantly at lucidity.
7. Subjective brightness and clarity of the imagery, and emotionality of the lucid-dream are significantly associated with those levels before lucidity.

Chapter XV. (Questionnaire items from large sample).

1. Significantly more lucid-dreams were reported by females than males, but this result is uncertain.
2. None of the questionnaire items correlated reliably with reported frequency of lucid-dreams in Subjects.
3. Most lucid-dreams are of the same or more vivid quality than ordinary dreams.
4. Most persons find lucid-dreams neutral or pleasant, emotionally.

5. Most lucid-dreams occur after 5a.m.
6. Most lucid-dreams have a duration of a few minutes or several seconds.
7. Most persons report that their thinking in lucid-dreams is as clear as when awake.
8. Thinking in lucid-dreams is reported to be more clear than in ordinary dreams.
9. Most persons have not performed experiments in lucid-dreams.
10. Most persons have never flown in lucid-dreams.
11. Colours in lucid-dreams appear mostly to be the same or brighter than in real life.
12. Colours in ordinary dreams appear to be the same or duller than real life.
13. Physical position of the body during sleep does not appear to be related to lucid-dreams.
14. Most persons report that visual distortions of images in lucid-dreams are sometimes observed.
15. Most persons report that time seems to pass normally or is shorter than in real life, in both lucid and ordinary dreams.
16. Most people report that they cannot control the course of events in lucid-dreams.
17. Most people wake immediately after their lucid-dreams.
18. Approximately half the sample had experienced a false-awakening, to their knowledge.
19. Most people report that lucid-dreams are more memorable than ordinary dreams.
20. Most people report that they would wish to experience a lucid-dream again.

21. An older sample, more used to experiencing lucid-dreams, might report more dream control and experimentation within the lucid-dream.

Chapter XVI.

1. Persons reporting experiencing lucid-dreams were found not to be more introverted than those who do not.
2. Persons reporting lucid-dreams were found not to be more intelligent than those who do not.

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In broad summary, a new methodology for the investigation of lucid-dreams has been demonstrated. Lucid-dreams appear to be true (Stage REM) dreams occurring for a few minutes within a matrix of ordinary dreaming. The basic physiological and psychological data of these dreams have been established, for one Subject. Events appear to happen in the order as described on waking. The emotional level may be physiologically determined though, despite the presence of consciousness. Certain sleep measures seem to be linked with various characteristics of lucid-dreams. Questionnaire. data was collected but no significant correlations were found. The artificial induction of lucidity in dreams is not a simple method, but a new technique shows promise. Finally, the finding that lucidity is always preceded by a REM burst led to the notion that lucidity occurs when cortical stimulation attains a certain level and discrepancies in the dream environment are present to trigger insight.

XXI.2 SUGGESTIONS FOR FURTHER RESEARCH.

A. Using 1-way signalling, from the Subject.

Firstly, considering external measures of lucid-dreams:

EEG ANALYSIS OF SPECIFIC DREAM ACTIVITIES.

Computer spectral analysis of specific dream activities delineated by ocular signals, could establish whether each activity had a characteristic EEG pattern. It may be that in dreaming sleep such a link is possible which is not detectable in the waking person. If this is so, on-line computer analysis could perhaps determine the dream-content of lucid and ordinary dreams.

MULTIPLE-ELECTRODE EEG MONITORING OF LUCID—DREAMS.

It would be of interest to ascertain whether specific brain areas are associated with the dawning of consciousness within dreams. Such information could have a bearing on the problem of consciousness generally.

FURTHER GENERAL MEASURES OF LUCID-DREAMS USING SEVERAL SUBJECTS.

The sort of basic physiological and psychological measures and data as recorded in the 1st A.W. study should be obtained from a large sample, to observe the range of individual differences. Secondly, experiments involving subject participation in performing experiments or observing phenomena within the dream and signalling accordingly.

MEMORY IN LUCID-DREAMS.

Recall of recently learnt, or long-term-memory, material could be measured in the lucid-dream state using the signalling method. Numbers could be conveyed, or if the subject knew Morse code, letters and words. The work would have relevance to the concept that various functions are ‘shunted-out’ (page 85) during Stage REM. Any such areas might be identified by this technique.

ESP (Extra Sensory Perception) AND LUCID-DREAMS.

ESP could readily be tested in the lucid-dream state, since the Subject is aware of the requirements of the experimental situation, unlike in ordinary dreams. ‘Guesses’ could be signalled from within the dream.

B. Using 2-way signalling.

Th electric-shock method probably provides the most effective mode of signalling to the subject, although if auditory stimulation does in fact penetrate to dream-consciousness, an ear-piece would probably be satisfactory.

TESTING OF THE DREAM WITHIN THE DREAM.

This type of experiment could provide information as to the Subject’s whole dream-personality. Intelligence, thinking, memory, and many other factors, could be tested within the dream state. Short-term memory experiments could be performed with material input to the dreamer. Once again, differences with those results from the waking state could provide clues as to what the function of the REM Stage is, as well as helping the theoretical modelling for these various faculties.

C. Attempting the artificial induction of lucid-dreams.

An ability to induce lucid-dreams in persons would be useful for experimental reasons and for the dreamer from a recreational point of view. In sleep-lab studies, the effect of REM rebound after drug withdrawal, or selective wakening, in Subjects who report fairly frequent lucid-dreams, should be observed. The higher frequency of dreaming on rebound may be associated with a greater number of lucid-dreams. The effect on the various physiological and psychological measures should noted too.

The electrical stimulation method seems to be of some promise. False-awakenings need to be constantly tested for by the Subject though. A further somatosensory signal to the Subject after the initial stimulation , associated with the thought 'I am dreaming' could aid the attainment of lucidity in a false-awakening situation. Another technique might be to induce lucid-dreams by classical conditioning i.e. the thought 'This is a dream' could be linked to a tone or electrical pulse to actually initiate the state. Whether lucidity or false-lucidity results would have to be determined by experimentation.

D.Obtaining lucid-dream information away from the sleep-lab.

Several Subjects could be given instructions on specific tasks to perform or observations to make in lucid-dreams at home. Consistencies and differences between Subjects could aid the formulation of a theoretical framework for lucid-dreams. Examples might be:

a. Observing the effect of cutting off visual imagery in the dream (Does a false-awakening result?)

b. Observing the effect of attempting to keep the dream imagery still (Is this possible?)

c. Giving various tasks to perform in order to ascertain whether a universal lucid-dream logic prevails. Waking simulators could provide Control data. The frequency of lucid-dreams for various populations e.g. abnormal, subnormal, cross-cultural, should also be discovered. Content analyses of lucid-dreams and control ordinary-dreams should be performed to detect consistencies and differences which might be useful for theorizing about dreams.

The purpose of these avenues of experimentation is to seek an understanding of the lucid-dream state since it can provide much potentially important information on many processes of mind, Self and consciousness. Also, the reliable induction of lucid-dreams could be, perhaps, of great recreational and therapeutic value.

The work described in this Thesis may have helped to provide a methodology and groundwork for such investigations.

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APPENDIX.

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(See page 96).

First lucid-dream of Keith Hearne.
Date: Wednesday, 28th July, 1976. Time: 10.00 a.m.

The lucid dream followed a long, languid, dream of traveling on a railway wagon.

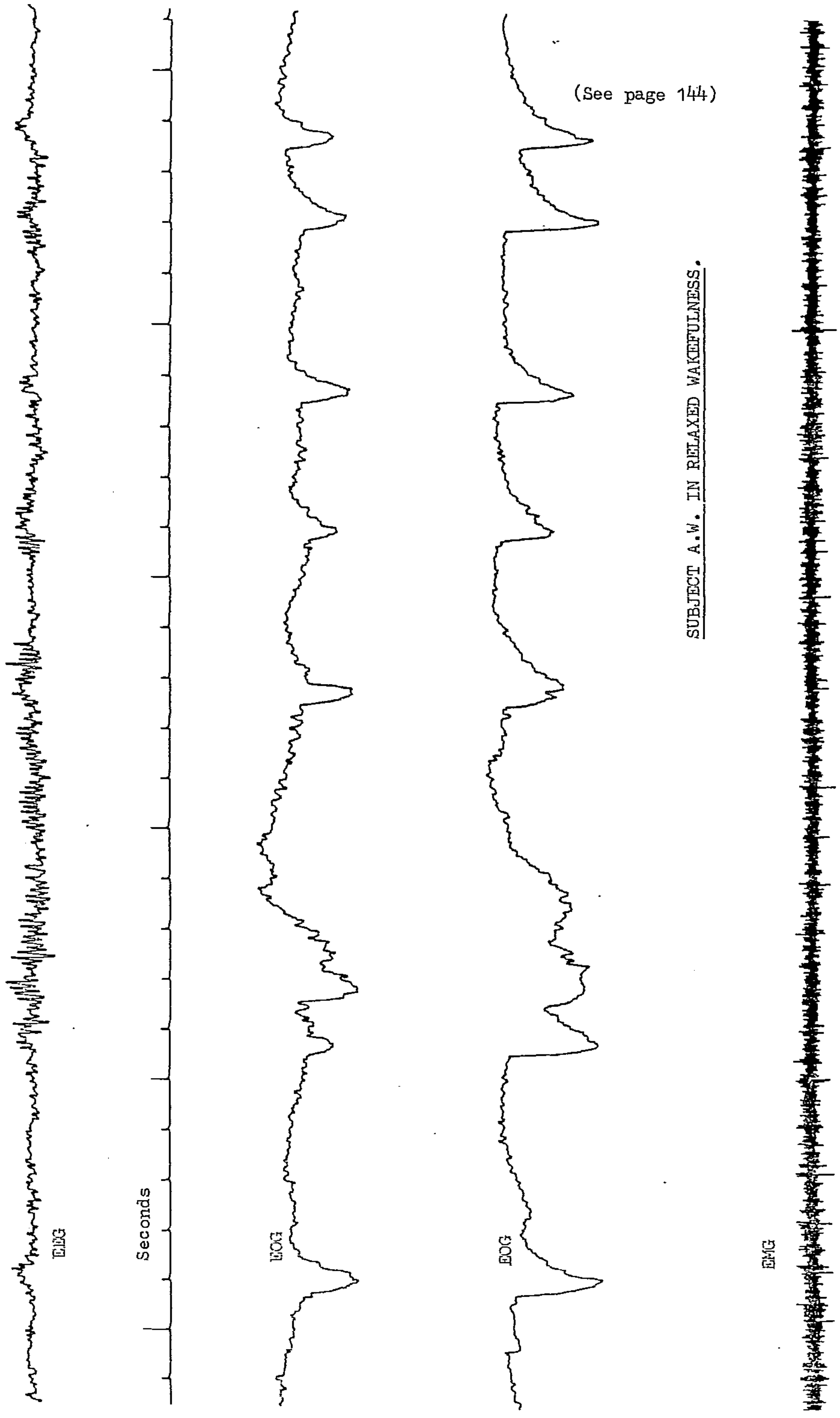
I was now wandering along on some rocks by the sea-side somewhere. I seemed to think it was the Mediterranean. People were around, and I could hear them talking happily and playing games. I looked down at the sea and noticed it was clear and deep. I moved on and again looked down at the sea. It was shallow here, and I thought I could make out some old pieces of metal in the water. This interested me. Next, the sea had gone, and I was on the beach digging a small hole, which seemed to enlarge automatically. I was then reclining on the sand feeling into the hole, and picking out old green-tarnished coins. The visual detail was very good.

Suddenly, I realised that this was a wish-fulfillment situation that I had often experienced before in dreams. I said aloud to myself "This is a lucid-dream". I stood up and looked around me. It was an incredible experience - a wonderful dawning of consciousness. It was a beautiful sea-side scene. The colours were much deeper than normal, and the layout was a bit odd. Perspective did not seem to be accurate. There were a few people around, swimming, etc.

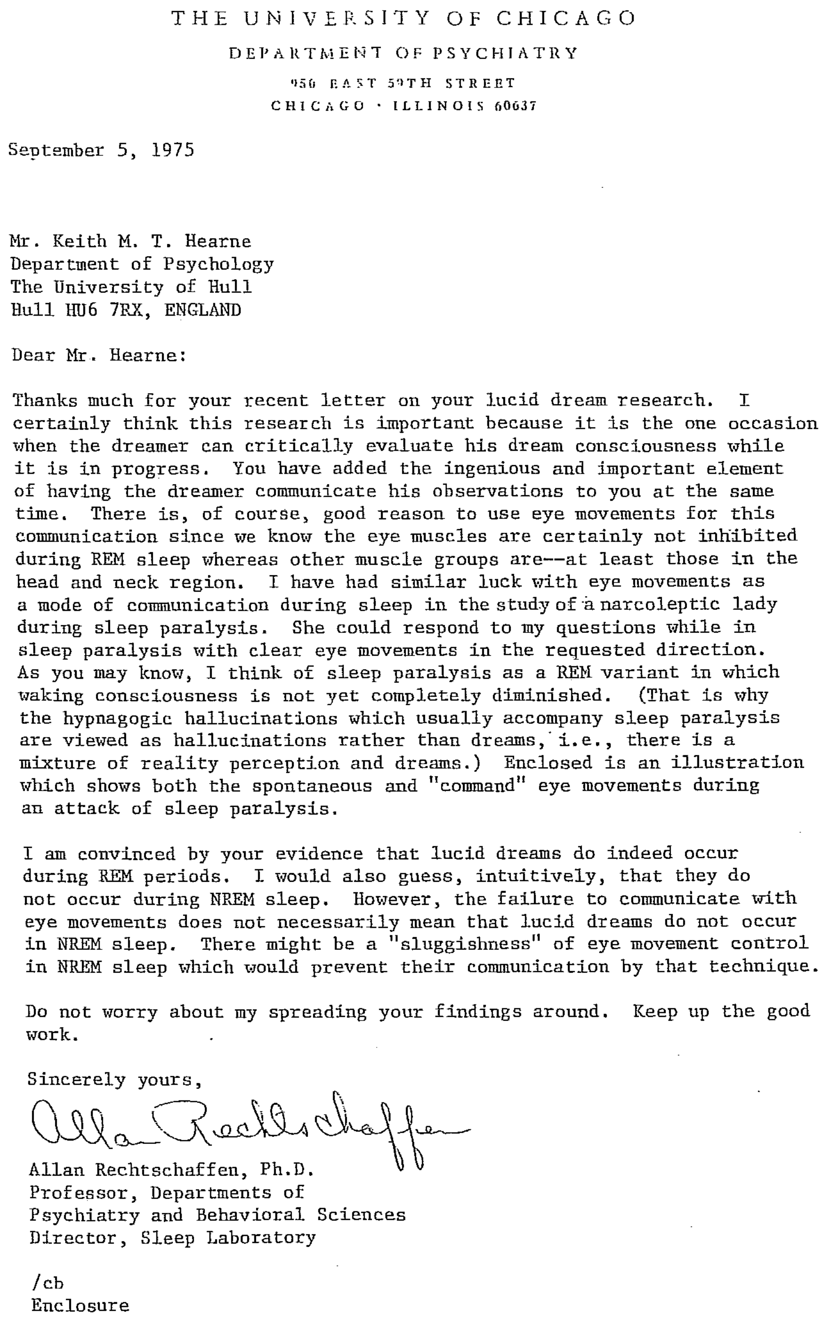
I noticed a 'tight' feeling around my eyes at first. I considered making the 8 eye-movements EOG signal as practice, but did not do so as there would not be any evidence I had made them.

I remembered the controllability aspect of lucid-dreams, and thought I would try to make a girl appear and that she should resemble someone I once knew. There was a stack of deck-chairs about 20 feet away. I walked up to them, thinking that perhaps she would be behind them. As I approached the deck-chairs, I remember thinking what a lot of dream-time this action would occupy. I looked round the pile of chairs, but there was no girl. I felt disappointed at this inability to control dream content, and walked on. Suddenly, I noticed a young girl walking towards me. She was short and dark-haired - which fitted the required description. I was wondering whether to speak to her, when she smiled at me and said "Hello". I took her hand and we walked off happily together. I asked her what her name was. She replied "Jane". Thinking there might have been some kind of time displacement, I also asked her which year it was. She said 36. This was puzzling to me and I thought perhaps she meant that she was 36 years of age - although she did not look it. I remember deducting 36 from 1976 and deciding to find out about her life by starting at her childhood in the war. Suddenly, we were at Birkenhead (I just knew it was), and we were looking for the home where she was born. I asked someone in the street a question about it, and he gave the name of a street (forgotten) and pointed the way. There were factories around. Explosions were heard in the distance - presumably this was war-bombing - and I felt that I had to leave her, as the dream was ending. Jane was sitting on a flight of stairs in a factory. I held both her hands and promised I would return to see her. She smiled. Her eyes were very green. I then woke up.

Comment: I think that, initially, the dream was very lucid indeed, but that conjuring up the girl allowed a fantasy situation to develop, which was not conducive to the maintenance of lucidity.



SUBJECT A.W. IN RELAXED WAKEFULNESS



THE UNIVERSITY OF CHICAGO
DEPARTMENT OF PSYCHIATRY
950 EAST 59TH STREET
CHICAGO · ILLINOIS 60637

September 5, 1975

Mr. Keith M. T. Hearne
Department of Psychology
The University of Hull
Hull HU6 7RX, ENGLAND

Dear Mr. Hearne:

Thanks much for your recent letter on your lucid dream research. I certainly think this research is important because it is the one occasion when the dreamer can critically evaluate his dream consciousness while it is in progress. You have added the ingenious and important element of having the dreamer communicate his observations to you at the same time. There is, of course, good reason to use eye movements for this communication since we know the eye muscles are certainly not inhibited during REM sleep whereas other muscle groups are--at least those in the head and neck region. I have had similar luck with eye movements as a mode of communication during sleep in the study of a narcoleptic lady during sleep paralysis. She could respond to my questions while in sleep paralysis with clear eye movements in the requested direction. As you may know, I think of sleep paralysis as a REM variant in which waking consciousness is not yet completely diminished. (That is why the hypnagogic hallucinations which usually accompany sleep paralysis are viewed as hallucinations rather than dreams, i.e., there is a mixture of reality perception and dreams.) Enclosed is an illustration which shows both the spontaneous and "command" eye movements during an attack of sleep paralysis.

I am convinced by your evidence that lucid dreams do indeed occur during REM periods. I would also guess, intuitively, that they do not occur during NREM sleep. However, the failure to communicate with eye movements does not necessarily mean that lucid dreams do not occur in NREM sleep. There might be a "sluggishness" of eye movement control in NREM sleep which would prevent their communication by that technique.

Do not worry about my spreading your findings around. Keep up the good work.

Sincerely yours,

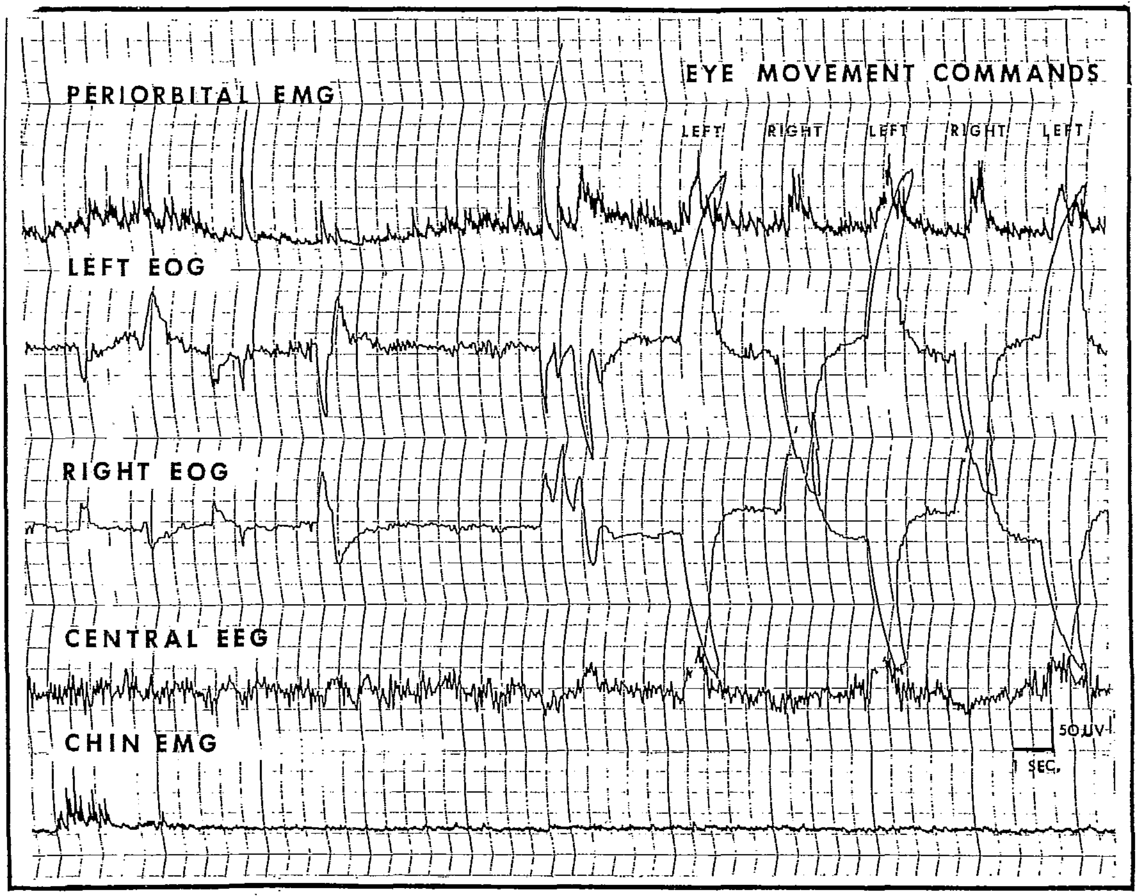
Allan Rechtschaffen

Allan Rechtschaffen, Ph.D.
Professor, Departments of
Psychiatry and Behavioral Sciences
Director, Sleep Laboratory

/cb
Enclosure

LETTER FROM PROF. ALLAN RECHTSCHAFFEN
(Director, Sleep Laboratory, University of Chicago).

(See page 145)


PERIORBITAL EMG
EYE MOVEMENT COMMANDS
LEFT
RIGHT
LEFT
RIGHT
LEFT
LEFT EOG
RIGHT EOG
CENTRAL EEG
CHIN EMG
50 µV
1 SEC.

(See Chapter VIII)

1st A.W. STUDY. Electro-physiological data.

SANDLER'S A-TESTS: (Lucid-dream nights vs. Control nights.)

% Stage 1. Data:

17.4	7.3	11 .9	13.7	11.4	6.6	(L.D.)		
4.46	7.1	6.2	7.27	5.5	7.7.	(C.)	A = 0.31	5 d.f. n.s.

% Stage 2.

36.2	44	24.3	59.2	38.1	50.8.	(L.D.)		
68	54	49.2	56.5	43.7	39.6.	(C.)	A = 0.56	5 d.f. n.s.

% Stage 3.

9.1	18	12	6.5	9	10.6.	(L.D.)		
9.6	14.35	10.6	8.6	22.4	8.3.	(C.)	A = 2.7k	7 d.f. n.s.

% Stage 4.

8.8	11.8	14.6	0.5	19.1	1.5.	(L.D.)		
2.55	10.48	7.77	10.7	17.2	0.	(C.)	A = 3.41	5 d.f. n.s.

% Stage REM.

5.9	11.1	18.9	11.96	17.4	20.	(L.D.)		
11.15	8.87	24.5	7.1	5.9	25.9.	(C.)	A = 75.20	5 d.f. n.s.

% Awake.

22.8	7.8	18.2	8.3	5	10.4.	(L.D.)		
4.3	5.16	1.76	9.75	4.8	18.48.	(C.)	A = 0.86	5 d.f. n.s.

Lights-out time. (Minutes about midnight.)

24	107	26	40	15	-60.	(L.D.)		
8	83	66	52	0	-19.	(C.)	A = 3.10	5 d.f. n.s.

***

Sleep-onset time. (Decimal hours about midnight).
0.75 2.12 0.78 1 .17 0.49 -0.04 (L.D.)
0.45 1.6 1.28 1.2 0.35 0.22 (C.) A = 27.31 5 d.f. n.s.

Total sleep time.
3.8 4.4 6.2 4.3 2.2 7.5. (L.D.)
4.67 4.57 7.36 4.23 2.18 6.65 (C.) A = 1.80 5 d.f. n.s.

Sleep-disturbances. Lucid-dreams vs. Control REMPs.
12 4 0 22 3 8 4 15 (L.D.)
2 4 0 13 2 4 5 17 (C.)
A = 0.35 7 d.f. n.s.

Heart-rate in Lucid-dreams vs. Control REMPs.
72 69 73 73 82 80 73 (L.D.)
77 66 75 72 71 72 65 (C.) A = 0.50 5 d.f. n.s.

REM activity in Lucid-dreams vs. Control REMPs.
2.6 1 1.5 1.75 2.1 2.5 2 1.2. (L.D.)
1.1 0.79 0.75 0.9 0.9 0.77 0.67 0.63 (C.)
A = 0.15 7 d.f. **$P < 0.01$**

REM amount before and after lucidity.
0.95 0.79 2.25 0.49 1.4 1.0 2.1 0.7
2.6 1.0 1.5 1.75 2.1 2.5 2.0 1.2 A = 0.32 7 d.f. n.s.

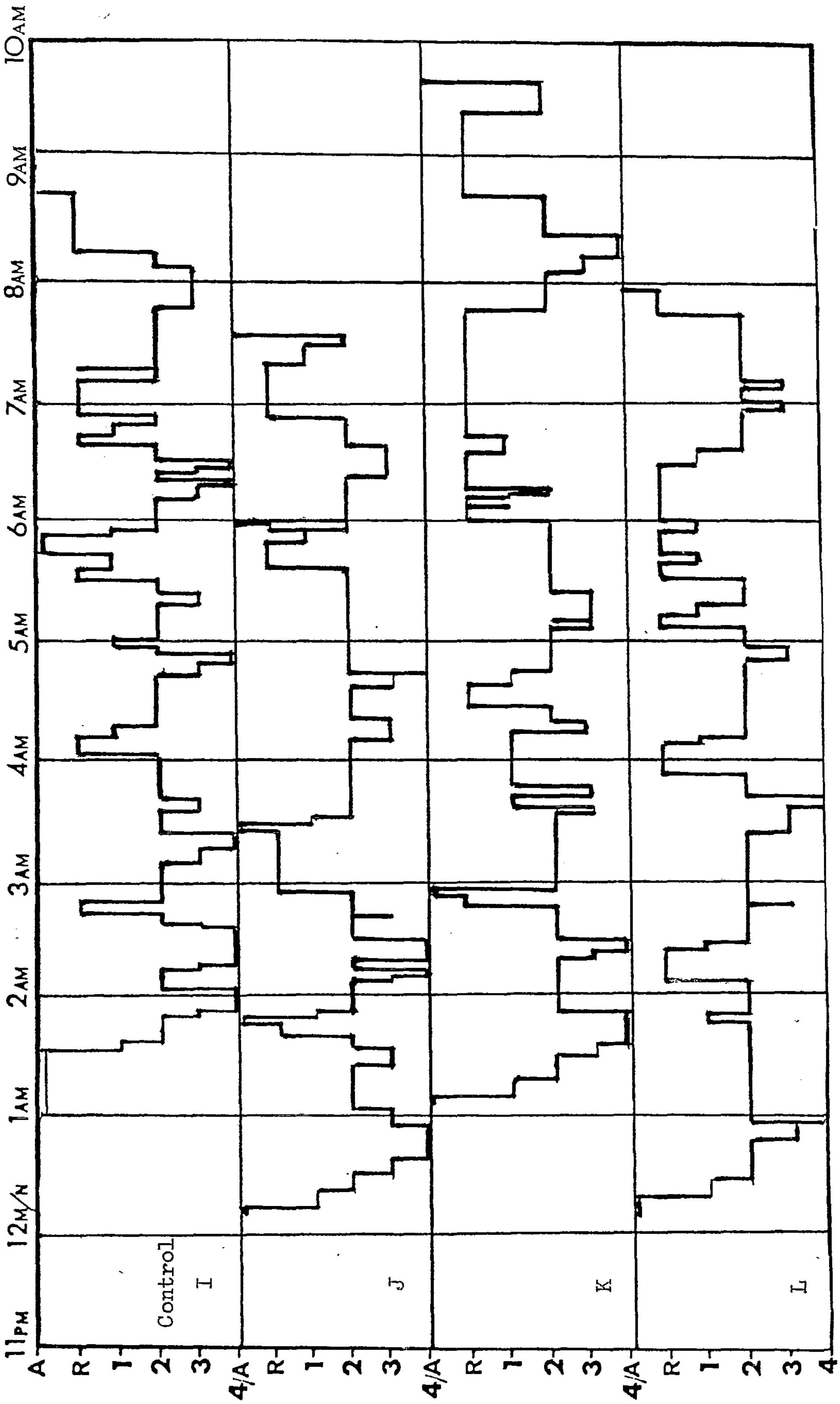
Heart-rate before and after lucidity.
70 64 76 73 79 76 66 66.
72 69 73 73 82 80 73 73 A=0.26 7 d.f. **$P = 0.05$**

Heart-rate in early and late parts of Control REMPs.
72 66 68 73 71 76 67
77 65 75 72 71 72 65 A=3.80 6 d.f. n.s.

Heart-rate in Control REMPs before and after a REM burst.
69 70 72 76 65 76 78 73.
72 70 82 81 70 85 81 74 A = 0.20 7 d.f. **P < 0.05**

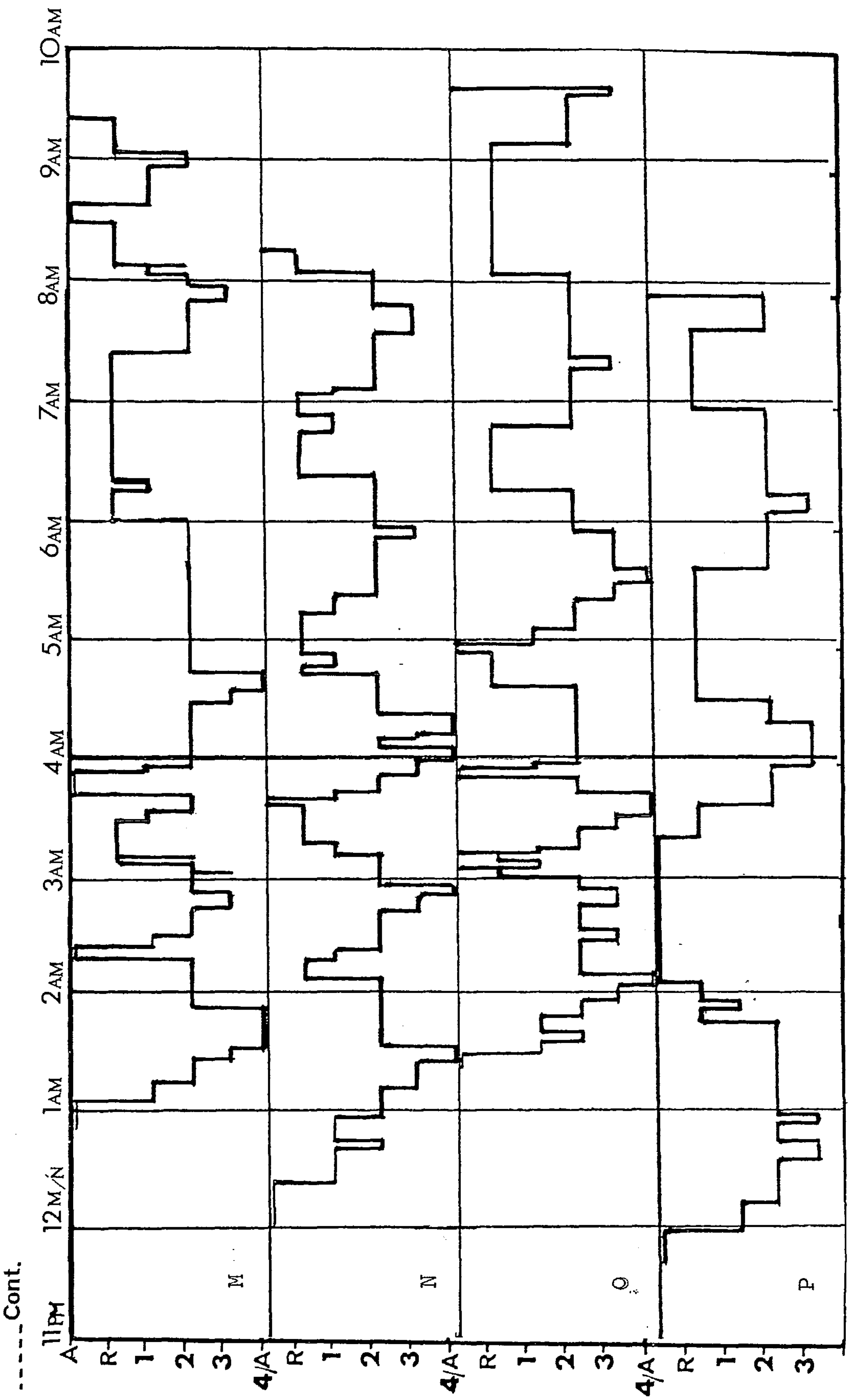
Heart-rate in lucid-dreams vs. Control REMPs.
72 69 73 73 82 80 73 (L.D.)
77 66 75 72 71 72 65 (C.) A = 0.50 6 d.f. n.s.

REM activity in lucid-dreams and Control REMPs after a REM burst.
2.6 1 1.5 1.75 2.1 2.5 2 1.2. (L.D.)
3 2.1 3 1.2 1.6 3.3 1.5 2 (C.)
A = 0.61 7 d.f. n.s.



A = awake, R = REM, and Slow wave sleep STAGES 1 – 4.
No lucid-dreams.

(2) CONTROL NIGHTS. 1st A.W. STUDY. (See Chapter VIII)



A = awake, R = REM, and Slow wave sleep STAGES 1 – 4.
No lucid-dreams.
(2) CONTROL NIGHTS. 1st A.W. STUDY. (See Chapter VIII)

(See page 193)

Account of lucid dream, transcribed from tape.

Subject A.W LUCID-DREAM: D Time 7.40 a.m.

I've just had a lucid dream, about 5 minutes ago. I'd been dreaming of an Island and what I was doing was reading numbers of houses and gates and doors and things you see. There was a shortage of numbers with no noughts or 6 - 9 - also a shortage of long numbers. Most of them were only 3 - figures. So well, it was a bit difficult. I started transmitting some and then I thought 'That won't do'. Anyway, I probably transmitted too many.

I can't remember any numbers I transmitted. I thought I'd found one when it said 20202 you see. I think there was a 203 and of course you can't signal a nought. I think I thought 'That's no good' and abandoned it. I think I did possibly one usable number, but I don't remember what it was.

(E: How did you realise it was a lucid dream?) I'd been dreaming about this man - what was his name - a film-star actually, living on an island. He'd been marooned or something - near Tristan de Cunha. Anyway, he tried to signal to them that it was only an island - there was nothing to burn (to make smoke signals), and he was stuck there.

I think he had some corn and he didn't know whether to eat it or try and grow it. Anyway, then this carried on to, well, there was a bit about the Goodwin sands. It wasn't really like that. There was some sand and a thing like Nelson's column sticking up. There was a great bell on the top.

Anyway, I was looking down at this sand - this small stretch, about 4 feet wide from the base of this thing to something else - I don't know what it was. I noticed these little tiny sort of ½ inch plastic discs - a sort of couple, or only one - in the sand. And I thought 'That's a funny thing to see there'. And I remember seeing one - its the sort of thing you see lying in the road – and somehow that did trigger the thought that I was having a lucid dream. I mean, perhaps because it was somehow so everyday - at least it was compared to the rest of the dream. I was excited by this.

In the lucid dream, a scene-shift occurred. I was among all these suburban houses – semi-detached bungalows and so on, and I was reading numbers on the gates and then it ran into a scene more like the seaside, where there were little shops selling the usual seaside stuff - postcards, buckets, etc. And I was looking around on anything that might have a number on it - bits of advertising and so on. I was looking at these bits of advertising. I saw this picture that caught my eye. It looked like a fairly random picture of a crowd at the seaside and there were one or two girls. And that made me think 'Ah yes, I'll have a look for that sort of thing for a moment'. So I had a quick look around. But I thought 'Well, I should. not be doing this'. There was a girl who was fairly tubby. I just lowered my head a bit to see what she looked like, but I thought it was wasting time. Even though I think this dream went on a very long time. I remember there was a bit where I was sort of reflecting on how long it had gone on. I mean, it seemed it might have gone on for maybe 3 minutes.

In one scene, there was a sort of sunken - not a proper, vineyard. It was like more an ornamental one. There was a lawn in the middle. It was a square and there was a wall around it about 4o yards on the side, and there were vines, well, grape plants, more like on individual supports - not sort of trailing all over the place. Anyway, there was this great big bunch of very dark red grapes. This didn't lead to anything - it was another scone. I was lucid through-out this.

I also remember a car. This was going round a corner. It was a bit like somewhere you might find in Hornsea or somewhere. There was a sharp corner and shops on the outside of the corner and the road was only about 10-12 feet wide. And there was quite a big car just going round the corner. I mean, nothing else could have gone the other way at the same time and there were quite a lot of people milling around. And I remember my attention was taken towards the car, like it would normally be - in case, you know, you might have to get out of the way.

Most of the numbers I saw were all on gates. But some of them were higher up, like hanging on the shops from the awnings. I did, this time, wake up directly from the lucid dream state and I could feel myself waking up. It was just a smooth transition.

The car was the last thing I remember. I started signaling numbers a few seconds after the initial signal. But I can't remember the first number. If I had to guess, I would say it was 223.

I tried to transmit 6 numbers - which were composed mainly of maybe one 4-figure, or even two 4-figure numbers, three or four abortive attempts consisting of 33figures and then maybe I'd run into a zero or a number bigger than 5, and I'd sort of hesitate.

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(See page 195)

Account of lucid dream, transcribed from tape.

Subject: A.W. LUCID-DREAM: E Time: 5.30 a.m.

Did you hear me speaking? I was trying to speak. I was giving a running commentary in parts.
(E: Did you press the button?) Yes. Well, I was in this crowded place and well, the whole thing seemed to go on for several minutes. I remember signaling, and going outside and the flying bit - you've got the flying bit?.
(E: Did you fly immediately after signaling the start of lucidity?) Pretty soon yes. But I didn't go a long way. I just went straight up in the air, about 10 feet. I think I flew and then gave three signals and then came down again. Oh yes, and at the point when I was giving a running commentary, I did begin to wonder whether I was waking up. But I think I managed to go back into it - and by way of a sort of supplementary experiment - oh that is part of the lying down thing – I did lie down, but I didn't lie down and pretend I was going to sleep. I didn't take it that far. But while I was near the ground I pulled a leaf - I think it was a thistle - some sort of fairly fat leaf and tore it in two and tasted it (this was in the running commentary bit) and I said it tasted sweet and sappy.

(E: Did you really think you were talking and it was getting over?) Well I did think it was possible. I also thought I was awake at that point. Just for a few seconds I thought I was going to wake up. I was aware, and was quite surprised at it going on for such a long time and I thought perhaps I'd got into the state more permanently than I intended.

Near the end someone was trying to get my attention, but he was talking far too slowly for me to bother with him and I was going to go outside but I'd come in through some sort of door-way. It was in this terribly dirty sort of barn place - it was a really rough place. It was dry (?) and there was sort of thick timber and the size of the place was maybe 12 feet from side to side - but it was quite long. I don't know how long it was. The character of the thing changed. It had dirty windows, but I don't think they were all the same sort. It seemed to be a much older building. The first building I was in, in this whole sequence that just happened, I think I thought it was at Leeds – and I thought it was something to do with the Convocation thing. You remember the Convocation thing at Hull yesterday? I remember thinking about that. But I wasn't at any ceremony. There was this sort of Park place - with a rather formalised place with paths - anyway, at one point I was in a building and I thought - I think this was after the initial flying thing - I was trying to get out of this building. A really significant point this - was very near the beginning of the dream. There was a strong wind and I couldn't walk very well against it and I tried leaning into it - but I just didn't seem to be making much progress. This was before lucidity. Now what happened - is where I think I nearly might have woken up because I remembered this air-conditioning noise. I thought that might have something to do with the wind and then I thought 'This is silly - I'm not really making much progress here'. There were some people behind me. They seemed to be walking quite normally I thought. Although I think I assumed they must be aware of this wind.

Well, for some reason, I wanted to get down this path. I don't know where I was going and I thought, well - I think I was becoming lucid at this point. I was vaguely aware that this was a dream now and so I could invent things. I could create things to help me. Oh, in that Ann Faraday book there was somebody who had a helper - a sort of dream image thing - a motorbike . Well, I thought that would be just the thing that 1 wanted. I didn't think about the book then - but I just thought about the motor-bike. Well, there wasn't a very strong sensation of a motor-bike. I mean, it wasn't a big shining machine, but there was a sort of sensation of holding onto handle-bars. But the bike was more or less invisible, but it did seem a way of getting down the path you see and the wind sensation seemed to get stronger,

After going down the path on the motor-bike, I'm not sure what happened after that, because I seemed to be inside a building - this was inexplicably - and now I can't remember at which point I signaled. Anyway, I was trying to get out perhaps in order to fly, and I was remembering that it was a dream and I could do things. There was some sort of wire grille - I think that was closing, and I was going to get through it. I wasn't particularly bothered about it because I had the feeling that because it was a dream, I could tear it apart - Oh yes, I saw 'The Bionic Woman' on T.V. tearing some wire netting a day or so ago. Beryl mentioned the bionic woman when we were talking when she was attaching the electrodes - that’s a powerful image.

(See page 200)

Account of lucid dream, transcribed from tape.

Subject: A.W. LUCID-DREAM: G Time: 9.40 a.m.

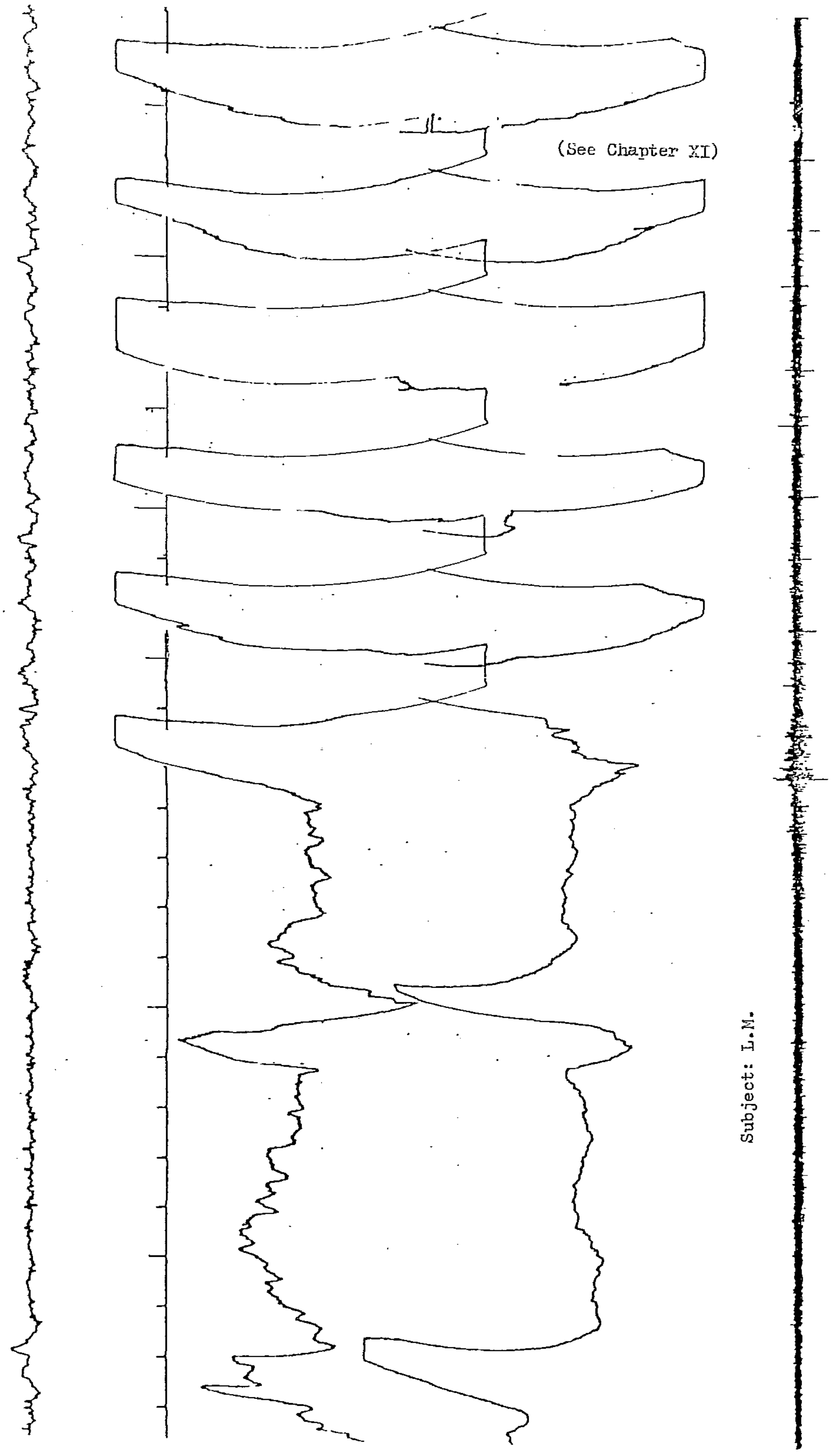
This lucid dream was reached from a state where I'd been drifting in and out. The situation was in a shaded garden. It's difficult to remember a lot of the detail because I had to ignore it in order to make the signals - but I definitely remember thinking that at last I was managing to do it (n.b. after several unsuccessful nights in the sleep-lab) which in other words is evidence that I was thinking clearly, but at the same time knew that I was dreaming.

I flew after signaling about 6 eye-movements. I rose a few feet into the air - maybe k or 5 feet, and flew along about 10-15, then down again. The flight was more or less horizontal. There seemed to be some sort of ceiling I think it was probably trees - which restricted the height that I could reach and it was pretty shaded. The garden seemed to consist mainly of trees and grass, although there was some sort of building, with very high windows and there was somebody in there, and I thought I was being watched.

The dream was preceded by other dreams in which I thought they could possibly have turned lucid and this particular one — it seemed to stabilise. I'd made other attempts and after the dream I made further attempts but it was difficult. I could get some of the imagery back, but it was difficult to make it stabilise so that I could do the experiment. I was afraid that when I pressed the button, before flying, that this would wake me. I felt it was threatening the stability of the condition.

(K.H.: Was that because you were convinced you had pressed the button?)
Yes, I thought that I could feel it. I mean, just trying it now, I think it would have worked, even with slight pressure. I remember pressing it quite hard - or trying.

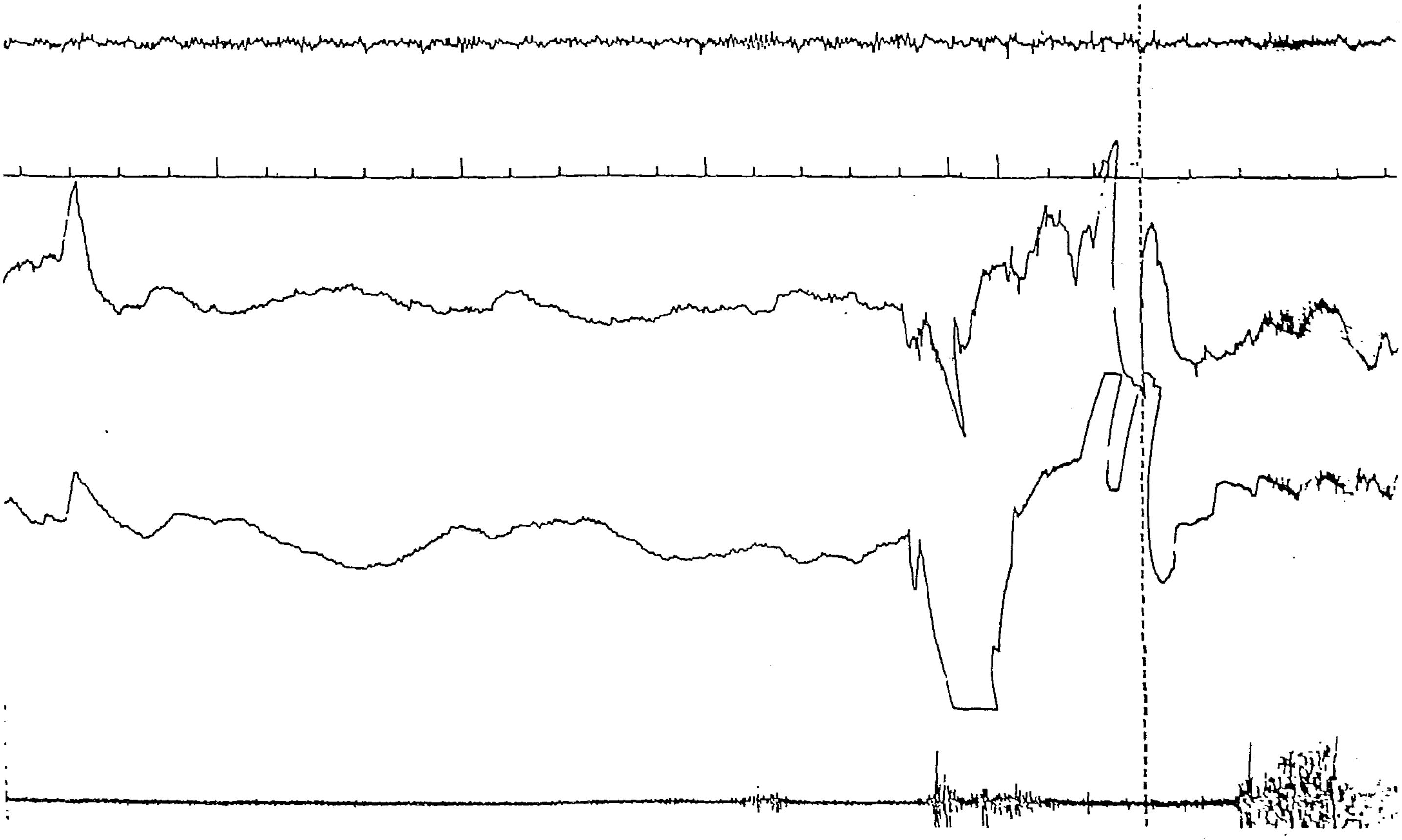
When I'd done the flying I couldn't really remember what to do next. I thought of doing some other physical movements - like somersaults- but this didn't seem to be very relevant so I didn't really do anything and after maybe 10-15 seconds, perhaps 20, I woke up, but I didn't wake myself properly and make notes at the time because I felt I might be able to go back into it.

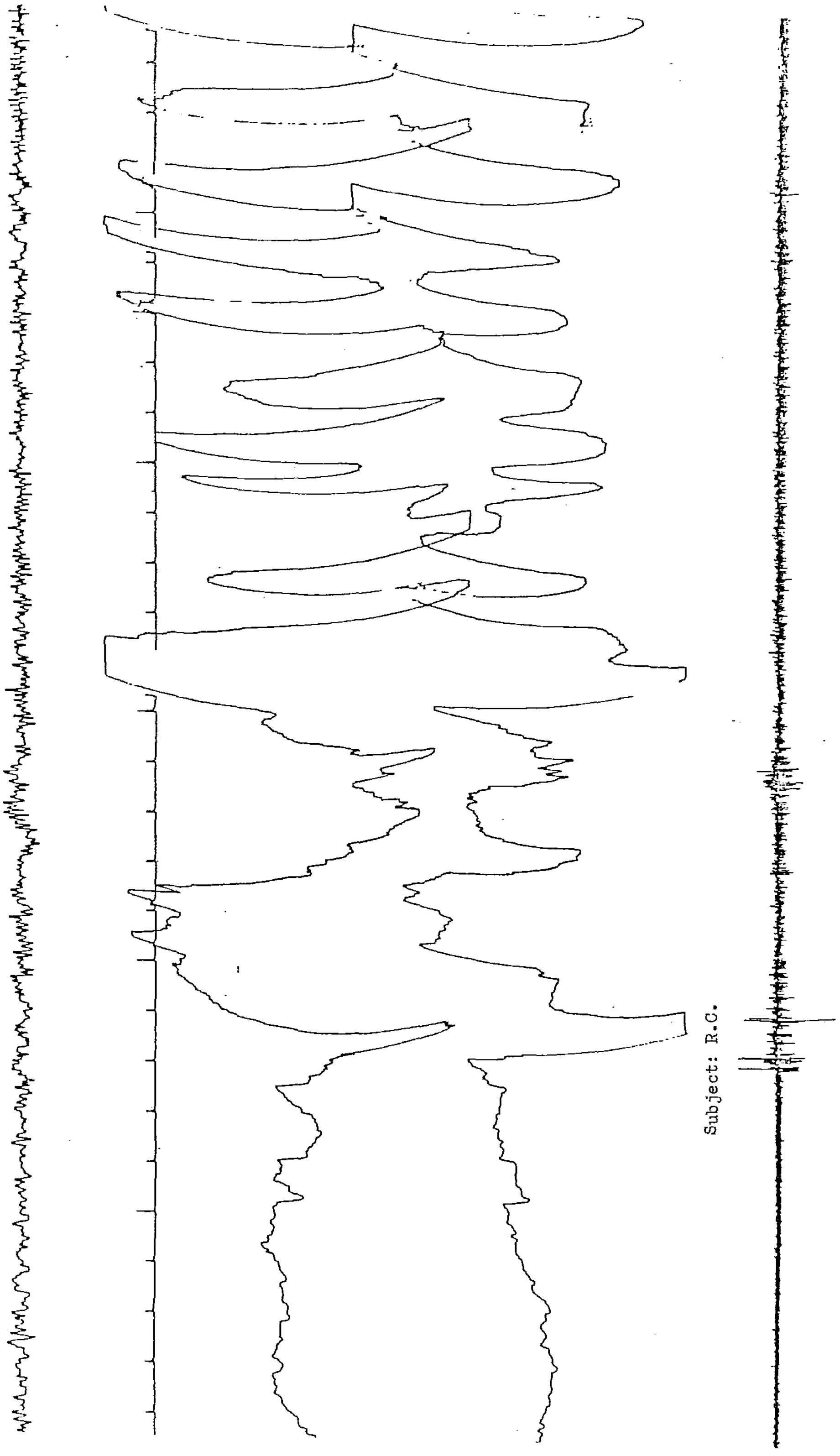


(See Chapter XI)

Subject: L.M.

Subject : SR.

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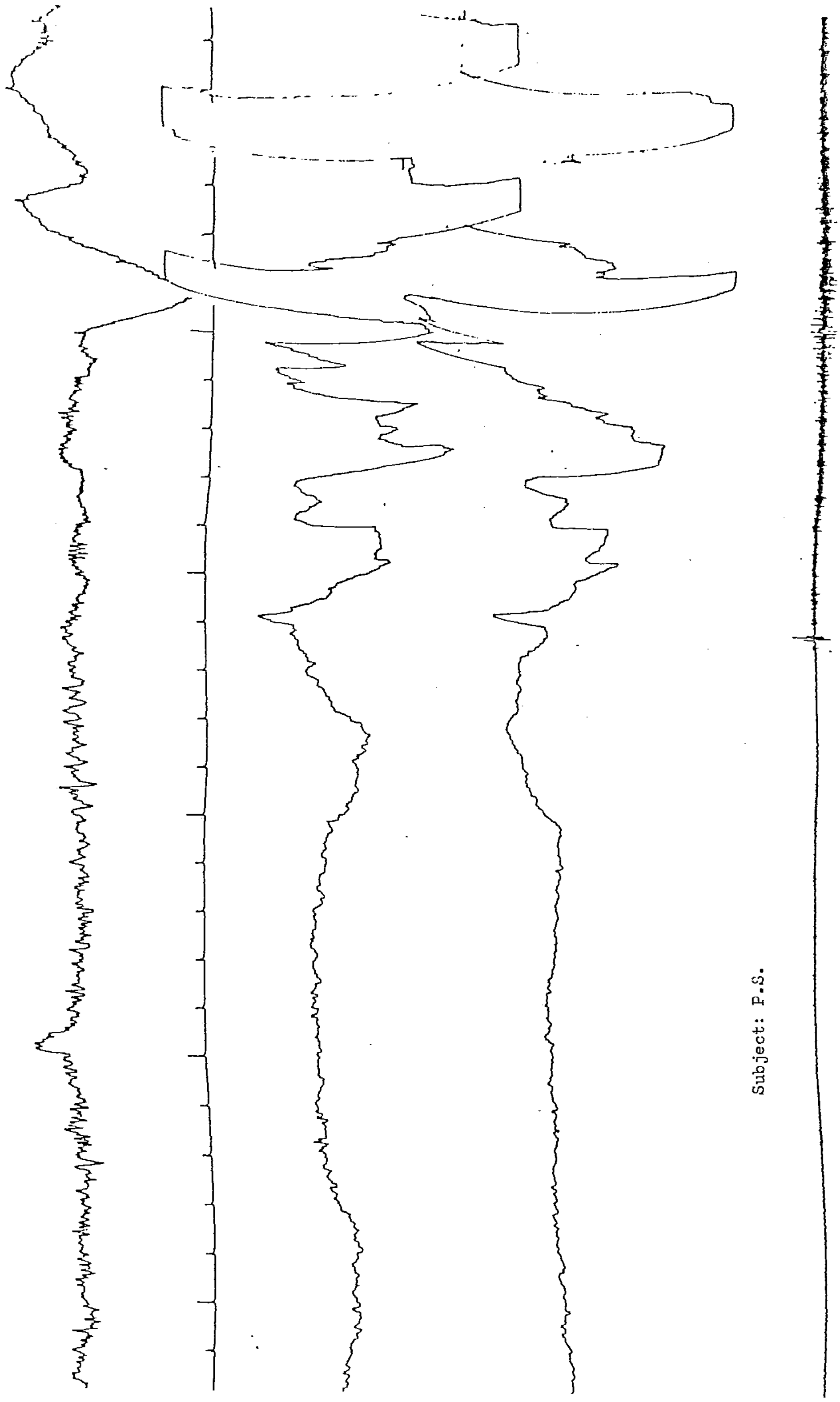
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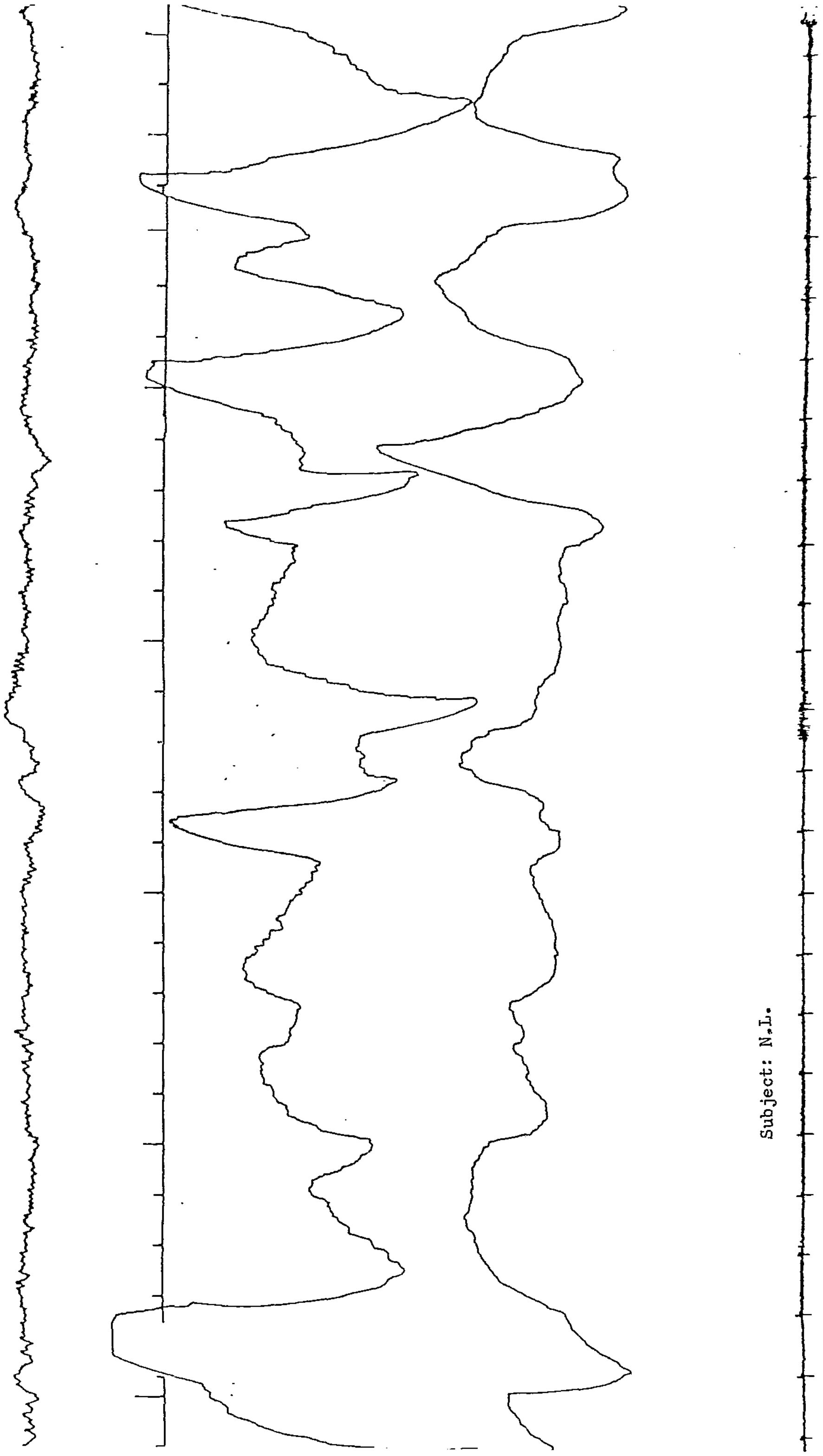
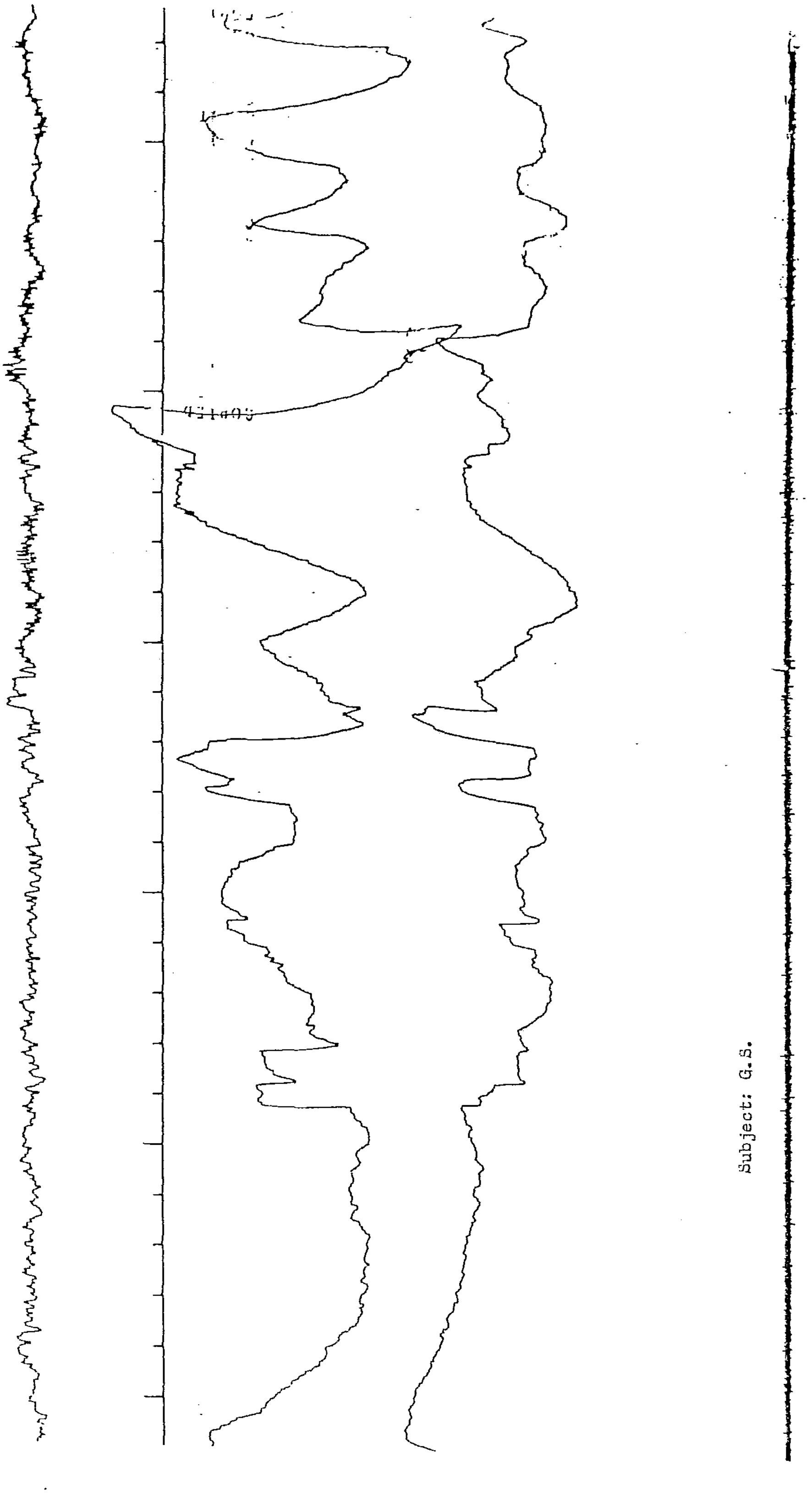
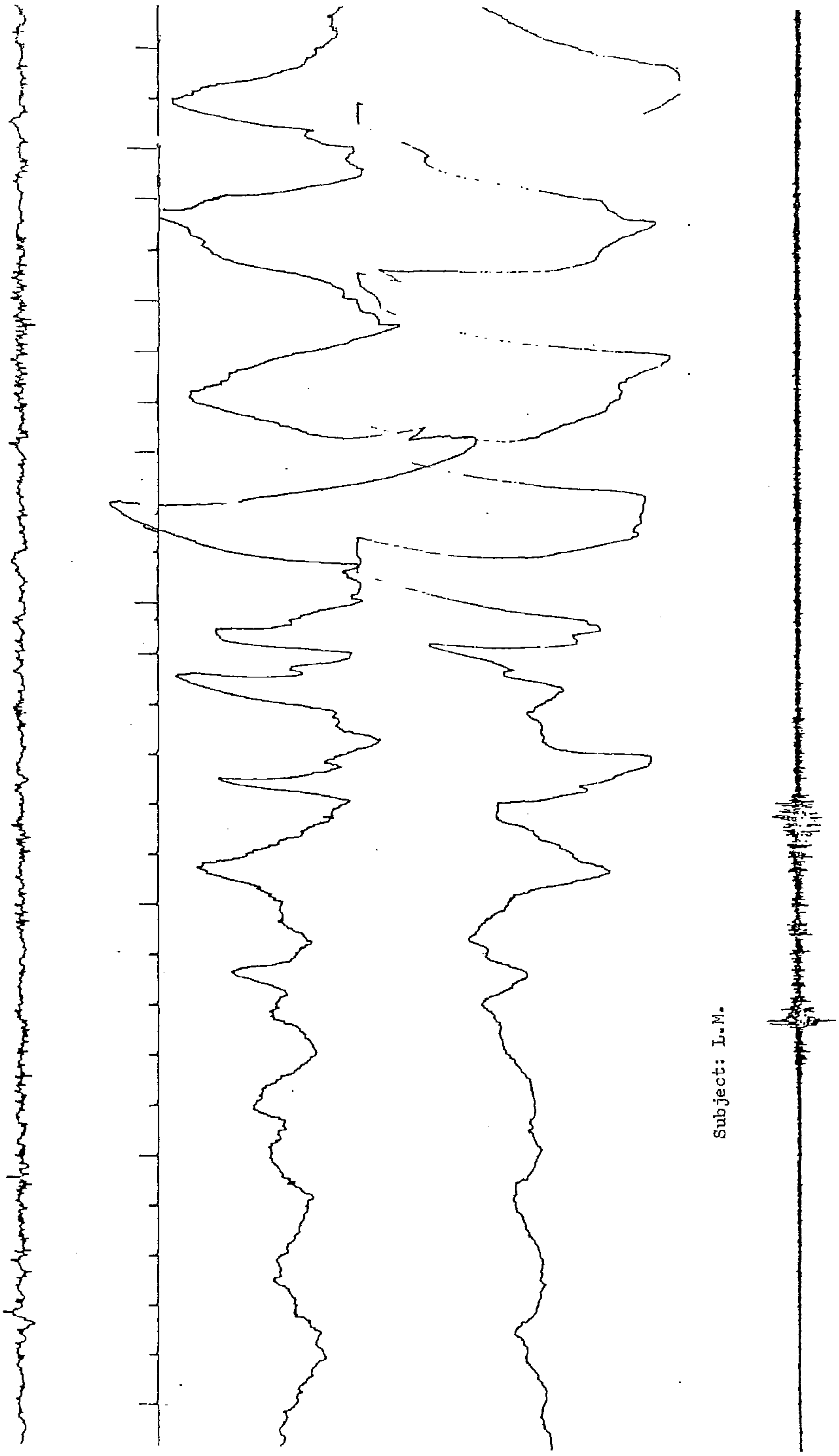


Subject: N.L.



Subject: G.S.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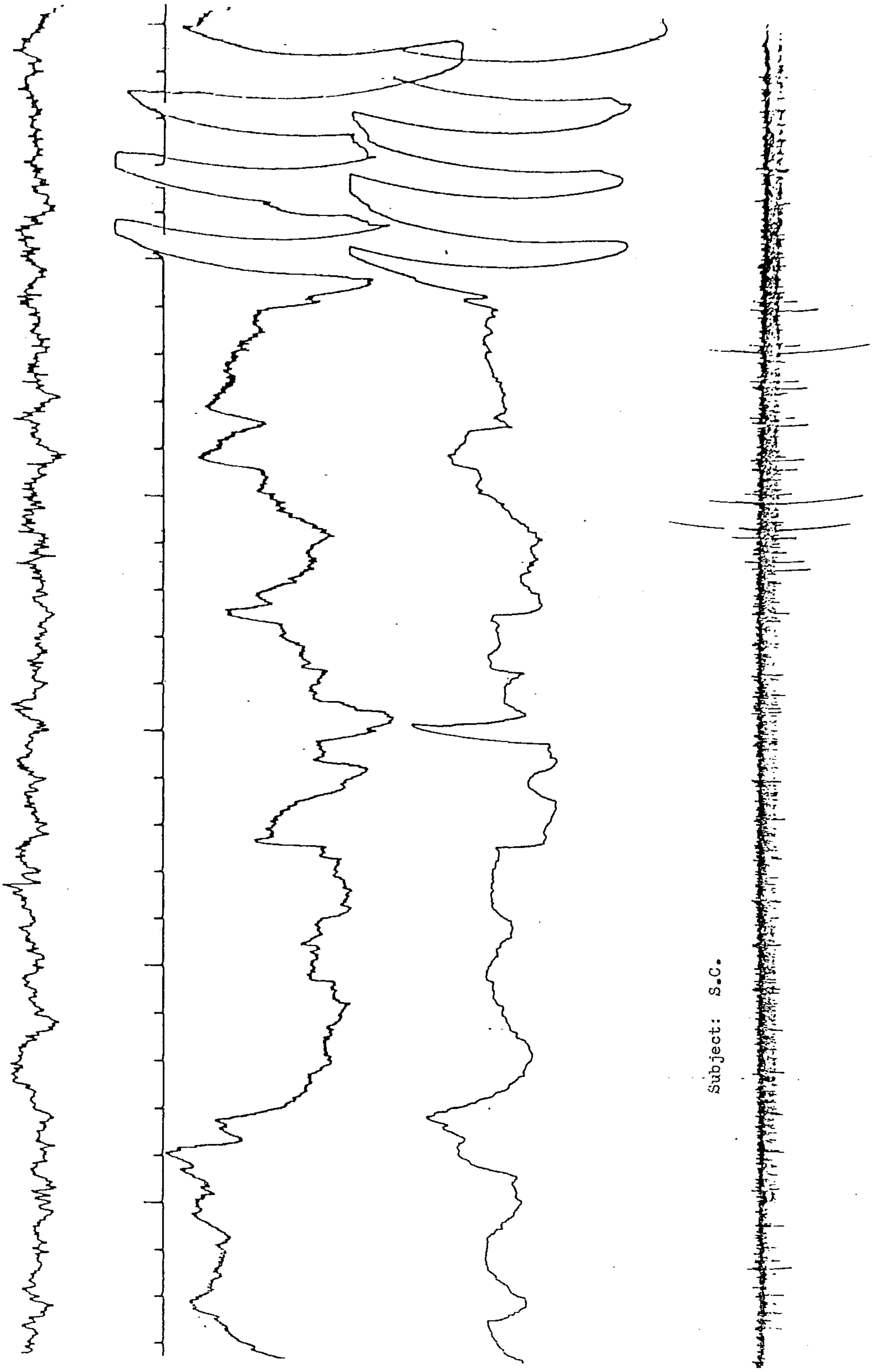
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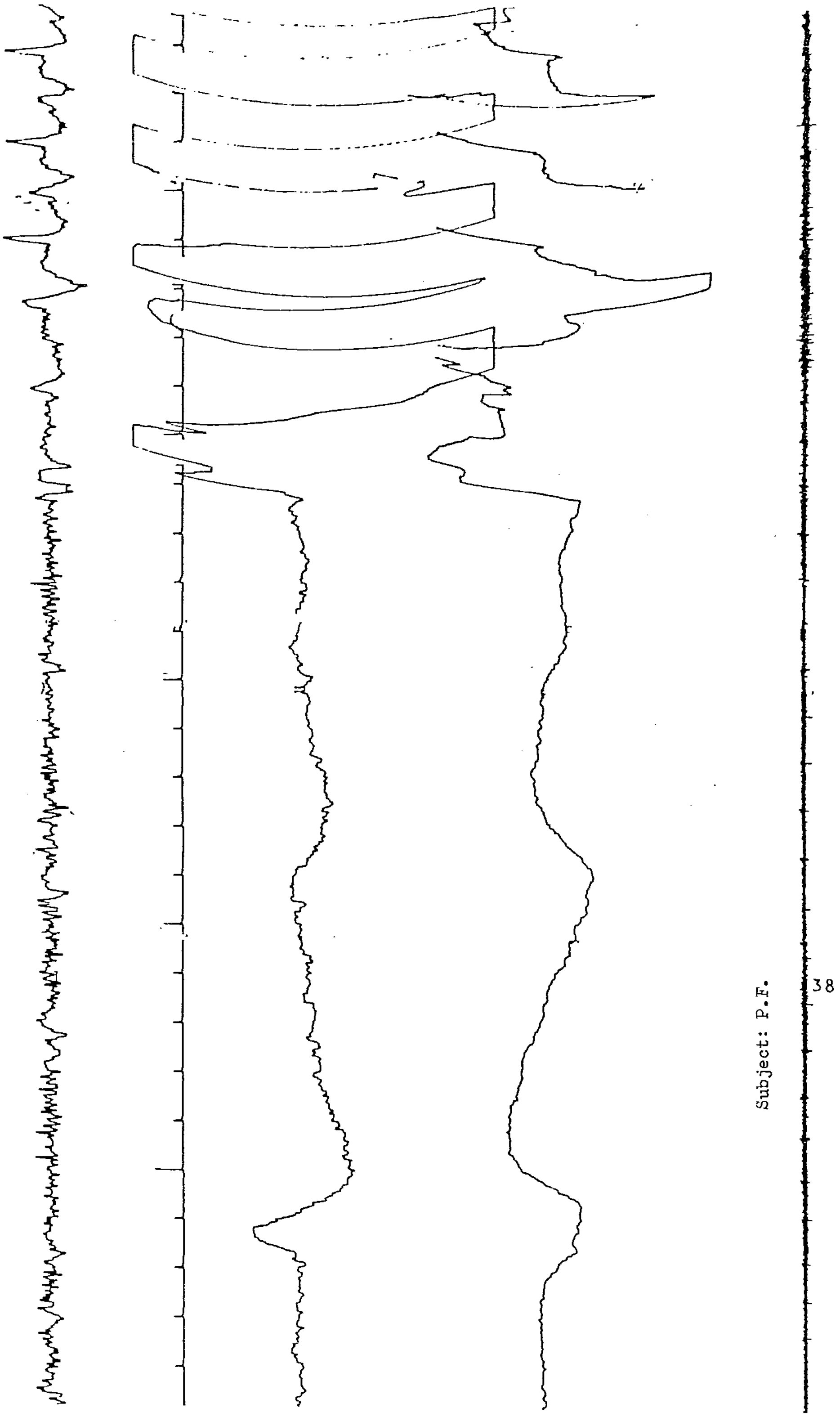

Subject: P.F.
38

(See page 239)

2nd A.W. STUDY.

Lucid-dream: 1 Time: 10.20 a.m. (Taped)

I'd just about given up. I thought we weren't going to have one. In fact I dreamt that you were in here and you came and sat down and I had to look back and I'd said 'You are here aren't you?' because you see I thought there was something slightly funny. And you said 'Yes' and I said 'Just for a minute I thought you were imaginary'. That was an earlier dream perhaps an hour ago perhaps. It was very light, the sleep I was in. I'd been wandering about this - Ah, I know what I thought was happening - I thought I'd left the laboratory that night and I was going back to the flat I think, and the logic wasn't right. I was thinking that you'd follow later or something but it was as if you wouldn't know whether I'd gone or not - or something like that. And then, well, it was an ordinary dream and then I came near this Hall of Residence, and thought 'That's the one I used to be in, you see, but I've never lived in a Hall of Residence except at Oxford just now. Well, anyway, then I was flying and I thought 'Ah, I'm dreaming', but even then I thought it was a bit shallow and I signalled - I hesitated a bit. I moved my eyes to the left then held it there a moment, wondering if it was going to be deep enough - this sleep, and then I signalled. I don't know whether it was the full 8 - but it was a definite signal, and then I thought you came in and I was saying something, but I wasn't sure if the words were coming out and then you seemed to be putting something on my eye and I thought I don't know whether it is a good idea - if it was one of those smells, you see - but I thought perhaps you know what you're doing and then you seemed to be saying 'Just hold that there a minute and I thought this was a test to see whether I was asleep or not, and I was trying to say 'Well, I don't think I ought to move' you know because I might go back into a deeper sleep, but not knowing I was in one. Well, what do you do in a situation like that? (E: Did you smell anything at all?) No, I don't think you got anything out did you? Before the flying bit I passed something like a sweet shop, and there was this jar which seemed to be full of water with sweets floating around in there and I thought they were pear-drops , though I didn't smell it. That's the only clue I've got to a smell. I don't remember incorporating an actual smell.

* S had recently returned from a conference at Oxford where he had stayed at a Hall of Residence.

n.b. An olfactory stimulus (lemon) had been presented.

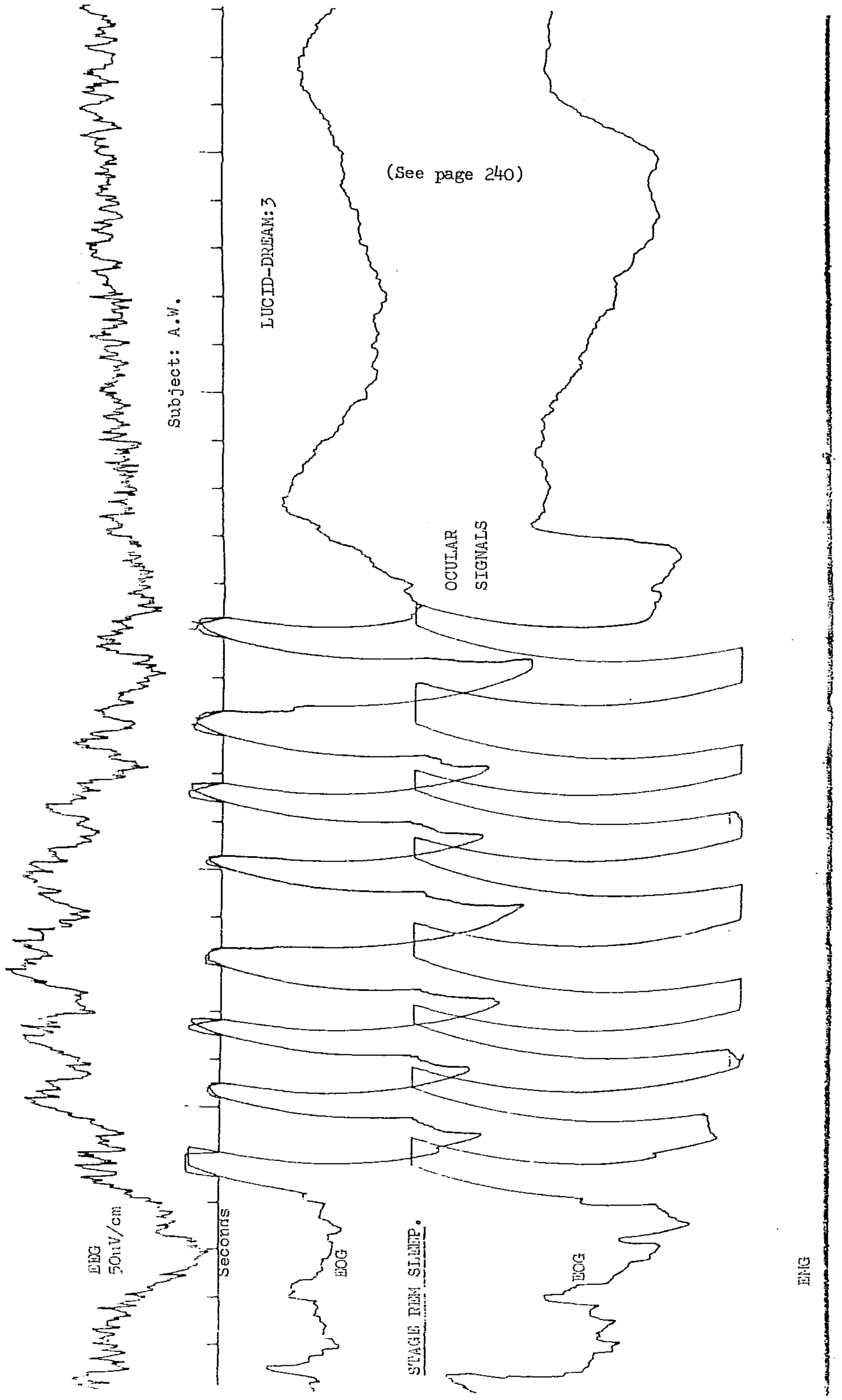
(See page 240)

2nd A.W. STUDY.

Lucid-dream: 2. Time: 3.55am. (S's notes made on waking.)

Signalled 'lemon', waited 20 seconds. No more stimuli. Woke up. Became lucid because seemed to be standing in 16 Carlton Road's garden. Large loose cabbage and snow. I thought, 'Late snow in August?' Decided to fly. Took-off straight up. Became lucid. Signalled L R L R L R (L R). Realised had not pressed button. Also, with signalling was losing imagery a bit. (Must slow down to allow regeneration between each eye-movement). Was aware of breathing – sniffing almost. Faster than usual (1 sec.) Seemed to detect lemon. Was aware would soon wake. Wondered if I was breathing out when Keith putting smell forward (because could detect no smells) and so missing it. Thought should have some automatic method but then thought human administration better, more flexible. Then felt was waking. Dream had gone. Not sure at first where I was and wondered if should signal some more anyway but then was clear. Did eye signals and button held down. No response. Shouted to Keith no response. K must be tired. Scene in dream seemed like dawn or sunset, but a bit fantastic as if made of glass, made to look like rough ice (i.e. not very good imitation.) Colours: orange, red. Rose in the air quickly at first. Scene not very faithful to original if 16 Carlton. Cabbage in garden large (2'6'' high), I thought second growth. Wonder if O.K. to eat. Take off came fractionally before lucidity, then about 1 sec delay possibly before remembering to signal. Was hot when woke. Also, lying on front. I think head turned to right. Conclusions must relax more. Must signal more slowly to keep imagery going. Fast signalling seems to wipe it. I.e. if attention is directed elsewhere, imagery dies. Imagery seems necessary to maintain the state. Maybe not. Must check.

(n.b. No olfactory stimulus was presented).



SUBJECT REPORTED FLYING WHILE MAKING OCULAR SIGNALS

(See page 240)

Account of lucid-dream, transcribed from tape.

Subject: A.W. Time: 10.10 a.m.

Place: Liverpool sleep-lab.

2nd A.W. STUDY. Lucid-dream: 3

There should be 8 pretty clear signals there. I think they were a little bit slower than normal. The reason it packed in - Oh I was flying by the way while I was signalling if that's any use. I didn't go up more than a few feet, I was just hovering around and signalling really, and trying to keep it going while I was signalling. Towards the end you see I was afraid that you were going to come in and say you are a bit tired and lets pack up. I thought you'd come in and because of that bit I think I got the signals clear while I was flying. I think I became lucid and then immediately started to fly and then immediately started to signal. The imagery was pretty clear. I felt as if I was in Springbank West near the - it wasn't quite like that there were more shops and sort of small arcades - like near the Botanic where it joins Princes Avenue. It was just an ordinary day - it could have been morning or afternoon. I was just walking along the footpath. I wasn't really doing anything particularly - I mean, there was no situation really apart from that. There's no reason I became lucid I know of. When I was flying I took it easy because I thought if I just signalled frantically to get the thing going, I might lose it - not because I was particularly afraid that might happen anyway but just you know, to make sure.

(E: Did the imagery go when you moved your eyes?) Well, it wasn't so good because you see it is just as if you are actually moving your eyes and it's difficult to look at things when you are moving your eyes. (E: What happened after you finished signalling ?) Well, I thought for some reason I mean this anxiety thing that you would come into the room, it was making me wake up and although I think I got the signals finished before it really began to come in and I was saying that you should have got 8 clear signals there and I was doing just about what I'm doing now, although I hadn't got so far into it. I mean I hadn't time. It was perhaps 15-20 seconds before I really woke up.

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Account of lucid-dream, transcribed from tape.

(See page 240)

Subject: A.W. Time: 11.00 a.m. Place: Liverpool sleep-lab.

2nd A,W. STUDY. LUCID-DREAM: 4.

I had a lucid-dream - it was deliberately induced. I must have had 9 hours sleep altogether. I had difficulty in getting back to sleep and wondered what I could do about getting into a dream and I decided I would visualize something definite. I already had an image which was voluntary and I thought if I concentrate on that and then try and move my body in this situation my awareness of my body-image could take over from the awareness of my physical body and then the awareness of my physical body should go and once I'd done that I'm dreaming. That's what I did and it went quite smoothly. What was happening was that I was in the house next door to where I used to live - it was my grandmother's house and I was there in the hall. It wasn't an absolutely perfect image of it but that is where I seemed to be and there was a big stack of seed trays –plastic seed trays - which I thought if I count these and concentrate my mind on the image and then I counted them - there were about 50 and they seemed to go up approximately 6 feet. I didn't start at the bottom. I just started counting and then I decided the thing to do would be to move about and I started planting things out in these trays. The actual material for this - the planting-out medium - the soil ,I didn't have to do anything about conjuring it up - it seemed to be there, which suggests that this dream was really being automatic. What I was concentrating on was moving about. It seems that I could possibly have lost it and it turned into an ordinary dream where I was not aware of what was happening. But anyway, I think after a while - possibly 2 minutes - I decided that all this activity in the dream was good and realistic. I planted one lot of seedlings, although I don't remember individually planting them in, but there they were and I was going to cover them up but something fell on them. Someone said something about 'this little accident' - about how things go wrong. I don't know what it was and I decided not to put so much soil over them because now they were a bit flat and I thought that will really finish them off , so I sprinkled a bit round them. This was all going on in the hall and possibly the sitting-room which was a sort of front room and then I decided I'd established the dream and I remember now I thought now if I'm going to do something else I'd better wash my hands and I went into the kitchen. The sink was full of washing-up and I didn't seem to think that was really important. I did remember about the soil getting mixed up with the washing-up and I suppose if it had really happened I might have been told not to do that. Anyway, I went to rinse my hands in this washing-up water. It was about that point that I became lucid. I was careful to remain aware of the background which was the kitchen - I was looking towards the window, so I wouldn't lose the dream by concentrating so much on the signalling. And then I made the 8 eye-movements and then I remembered about sniffing - to try to sniff the smells and also to try and alter the breathing rate. Well I did that for about 12 seconds at about this kind of rate (1/sec) at about 1 per second or a bit faster. I could hear it and I wondered whether what I was hearing was what was in the dream or whether I could actually really hear it. I couldn't hear the clock that was ticking by the bed, but I wasn't listening for it. While I was sniffing I was in the kitchen for a few seconds and then I decided I would go outside as something to do - to do with the dream which I would do at the same time as sniffing, just to keep the dream going and I went outside. I think this happened more quickly than it would have actually done, but very shortly after that I did in fact lose the dream - I just woke up. I didn't know whether I was concentrating too hard on something I had to do. I did in fact get a bit mixed up. I couldn't detect any smells but then I thought I could smell I think the lemon and started to signal, but they weren't in fact eye-movements, just breaths - so I still need to improve my efforts at being calm and collected and doing the right thing. This new technique seems to be quite promising. Subjectively, it seemed to be equivalent to other lucid-dreams. There was nobody else in the dream. It was in very familiar surroundings and I could concentrate on what I was trying to do. I wasn't being distracted by the content of some dream in which I suddenly realised I was dreaming. Any activity in this dream was what I was doing, which of course made it pretty controllable.

(See page 241)

Account of false-awakening transcribed from tape.
Subject: A.W. Time: 5 a.m. Place: Liverpool sleep-lab.
2nd A.W. STUDY. FALSE-AWAKENING: 1

I felt some shocks. I thought, as had happened before , that you had come in and I think I said ‘Blast’ at some point, when you actually came in or when I dreamt you came in. You were feeling the temperature of my back for some reason and you said I was centering on some new sensory threshold or some such phrase. So I’d given up. Then very soon afterwards - a few seconds - I heard you say ‘4’ which meant I’d actually woken up I think. That’s when I said ‘I know I’ve woken now, but I signalled 4 anyway and I remember thinking it will be practice for next time. That is what I should have continued to do but I was so sure I’d woken up. I signalled 8 on getting the shock originally.

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(See page 241)

Account of false-awakening, transcribed from tape.

Subject A.W. Time 10.15 a.m. Place: Liverpool sleep-lab.

2nd A.W. STUDY. FALSE-AWAKENING: 2

I thought I'd woken up from this dream and I was in the process of going back to sleep. I had a false-awakening, although it wasn't in the sleep-lab - it was connected with it. K.H. seemed to be first of all giving me shocks when I was asleep and then as usual I thought I woke saying 'No, No', then shouting that I was awake 2 or 3 times. Then there seemed to be 1 or 2 more shocks and I thought K.H. was adjusting it or something. I thought that it might be better if he was in the circuit as well - it would be easier to adjust. Anyway, then I thought I was going back to sleep but then I smelt the smells. Well, I signalled as usual. I signalled before the last shocks. It may have been a bit raggy. I think I signalled as a matter of routine. It was not because I knew I was lucid. I had assumed I'd woken up. I think I'd forgotten about the smells. We'd been through this routine but I thought they seemed to be coming from nowhere. I know that K.H.'s coming and holding the smells there, but I'm not sure at what point I woke up. I think it was just after the 2nd smell when I was signalling 'toothpaste'. After the first shocks it was like a dream. I seemed to be leaning on some upturned wooden chairs and a gas-stove. I don't know what the hell that had to do with it, but it didn't strike me as being incongruent. I just thought that once again the shock had been too great and it had woken me. But I had this sensation of waking up while the shocks were going on , so it was a false-awakening. I can't remember

absolutely clearly giving the signal (initial signal) it may have been so routine that I didn't make a point of noticing it. I think the realisation I was lucid if it came at all came when I was signalling the smells. I think you can signal information without being lucid. There wasn't much in the way of imagery at that point.
I think I thought I was lying in bed with my eyes closed and not really seeing anything. I had a waking sensation (real) when I was signalling the 2nd smell. The smells were: lemon and then toothpaste.

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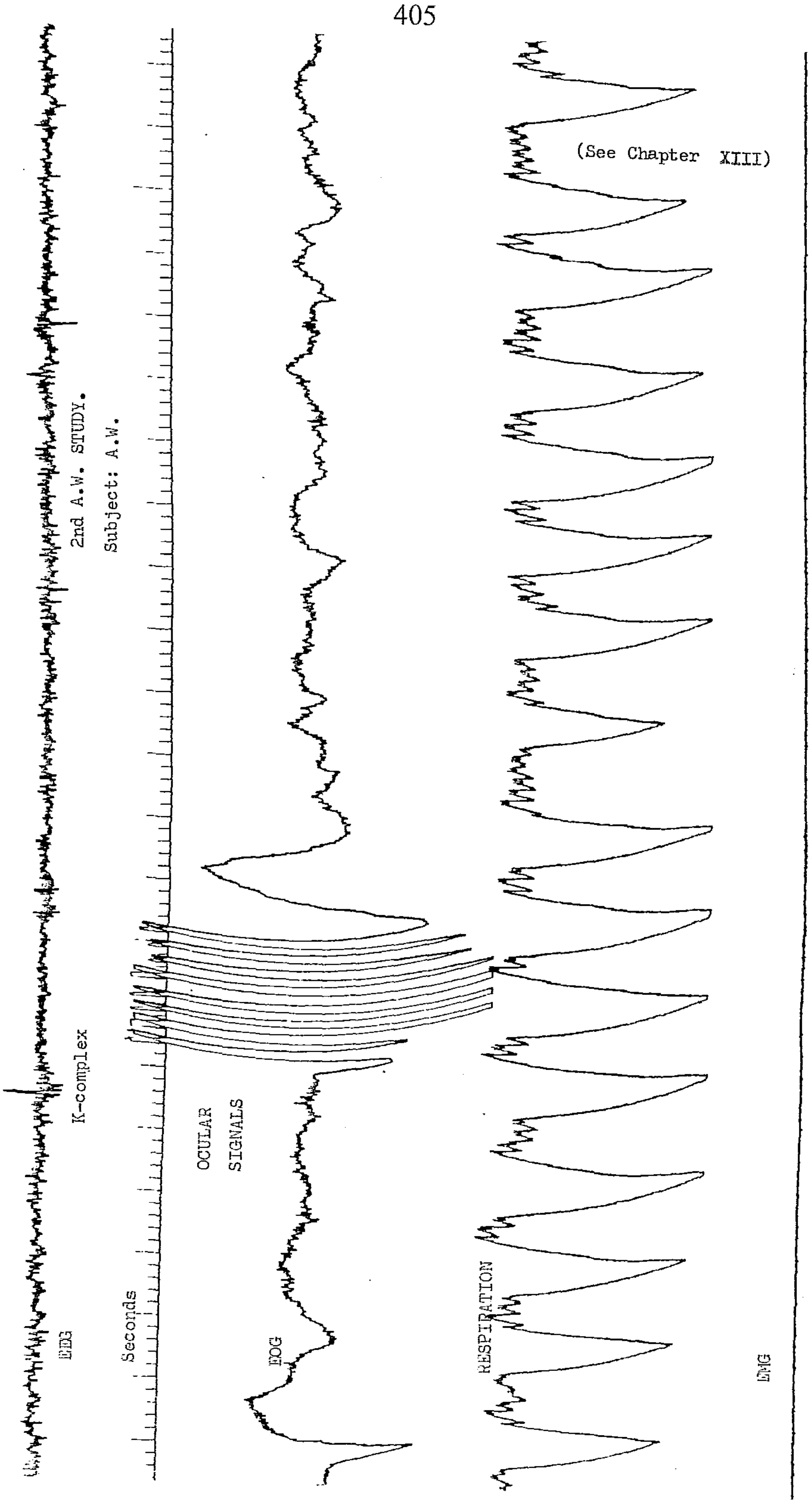
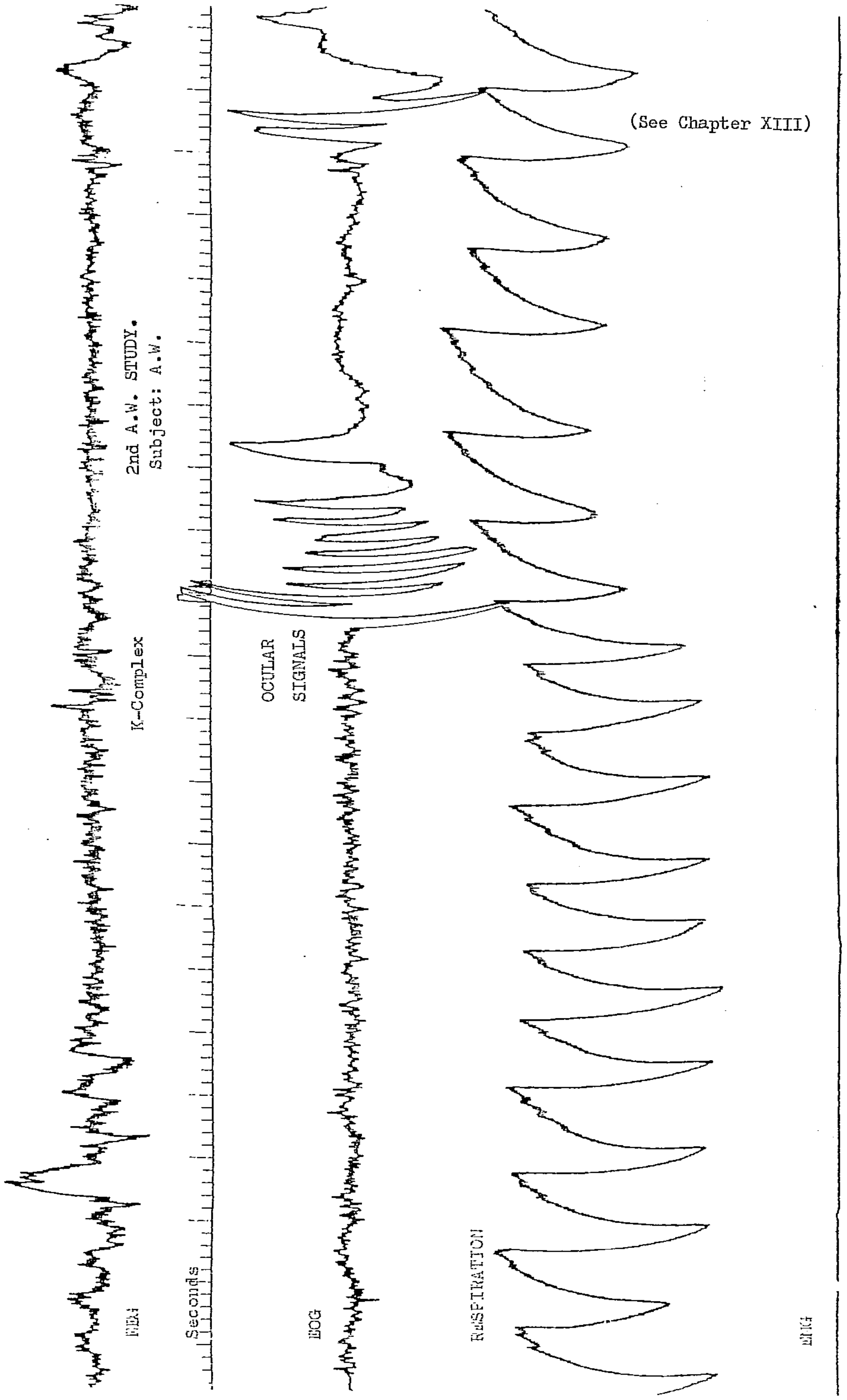
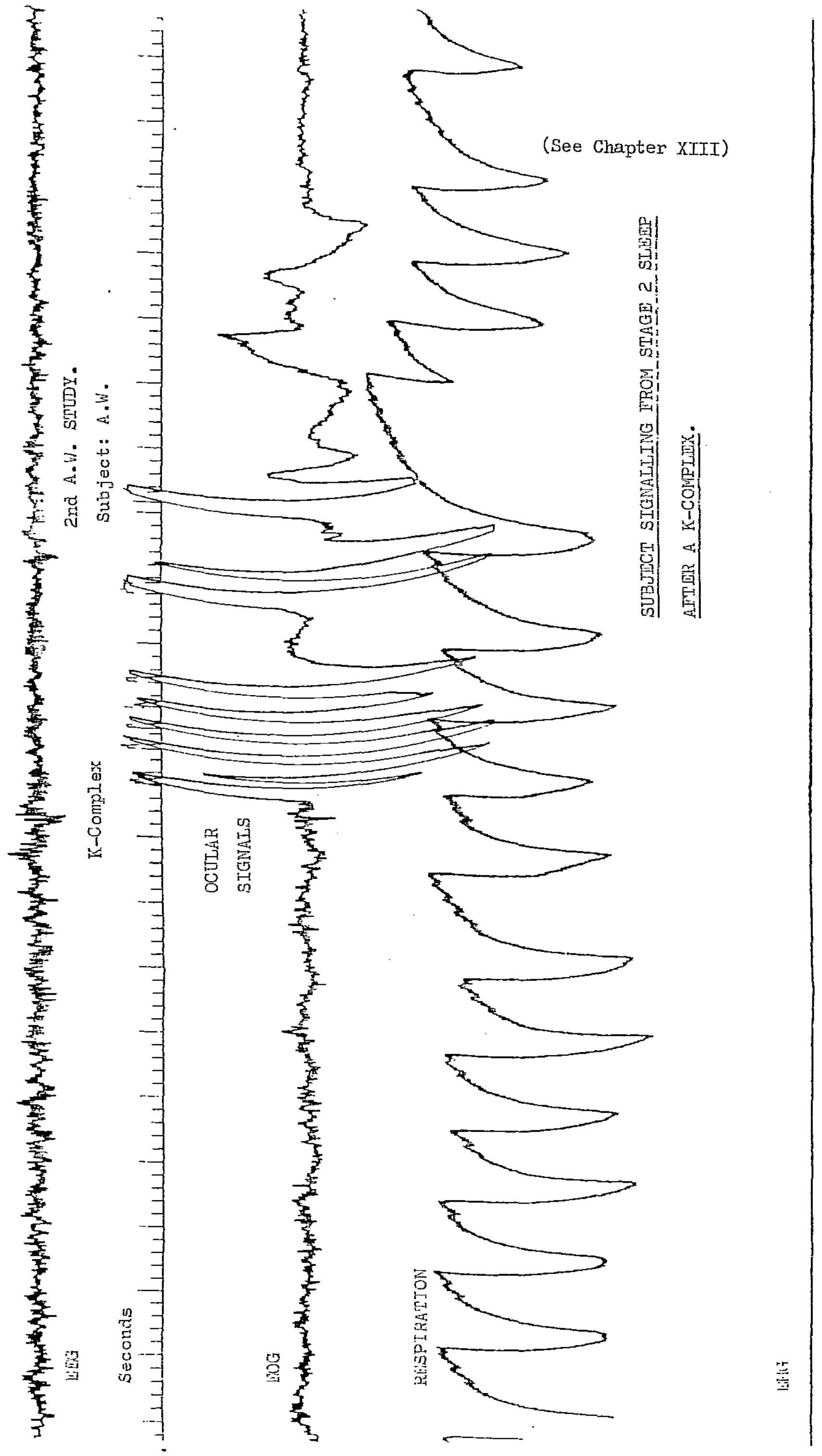


SUBJECT SIGNALING FROM STAGE 2 SLEEP, AFTER A K-COMPLEX



SUBJECT SIGNALING FROM STAGE 2 SLEEP, AFTER A K-COMPLEX



SUBJECT SIGNALING FROM STAGE 2 SLEEP, AFTER A K-COMPLEX

POST- LUCID DREAM QUESTIONNAIRE

(CHAPTER XIV.3)

*****

1.
On average, how BRIGHT were the visual images in the dream BEFORE you realised you were dreaming?

Very dim and dark — Like in very strong sunshine.

1 2 3 4 5 6 7

2.
Ditto AFTER you realised you were dreaming?

Very dim and dark — Like in very strong sunshine

1 2 3 4 5 6 7

3.
On average, how CLEAR were the visual images BEFORE you realised you were dreaming?

Very vague and hazy — Extremely sharp

1 2 3 4 5 6 7

Ditto AFTER you realised you were dreaming?

Very vague Extremely sharp
and hazy

1 2 3 4 5 6 7

5.
For how long do you think you continued to realise you were dreaming?

Secs.-------------

6.
On average, how clear was your thinking, compared to your normal everyday thinking when awake, BEFORE you realised you were dreaming?

Very unclear			Same			Much more clear then usual
1	2	3	4	5	6	7

7.
Ditto AFTER you realised you were dreaming?

Very unclear			Same			Much more clear then usual
1	2	3	4	5	6	7

8.
On average, how EMOTIONAL was the dream, BEFORE you realised you were dreaming?

Unemotional						Extremely emotional
1	2	3	4	5	6	7

9.
Ditto AFTER you realised you were dreaming?

Unemotional						Extremely emotional
1	2	3	4	5	6	7

10.
On average, how strange or bizarre was the dream BEFORE you realised you were dreaming?

Normal not bizarre						Extremely bizarre
1	2	3	4	5	6	7

11.
Ditto, AFTER you realised you were dreaming?

Normal not bizarre						Extremely bizarre
1	2	3	4	5	6	7

12.
How likely is it that you would really find yourself in that dream situation'?
Very unlikely possibly Very likely
1 2 3 4 5 6 7

13.
How easily could you control the events in the dream after you realised you were dreaming?
Not at all Very easily indeed
1 2 3 4 5 6 7

******

Re- Chapter XIV

REFERENCES TO ACTIVITIES AND PERSONS IN DIARY.
Lucid-dream (E) vs. non-lucid-dream (C) days.

	1	2	3	4	5	6	7	8	
REMOVALS & DELIVERIES	/	0	0	0	0	/	/	/	E
	/	0	/	/	/	/	0	/	C
SPECIFIC TASKS	/	/	0	/	0	0	0	/	E
	0	0	/	/	/	/	/	0	C
VISITS TO LIBRARY	/	0	0	0	0	0	0	0	E
	/	0	0	0	0	0	0	0	C
MENTION OF DRINK	/	/	0	0	0	0	0	0	E
	/	/	/	/	0	0	/	/	C
LATE OPENING SHOP	/	0	/	0	0	0	/	0	E
	0	0	0	0	0	0	0	0	C
F.	0	0	0	/	/	0	0	/	E
	0	0	0	0	/	0	0	0	C
K.	0	/	/	/	/	/	/	0	E
	/	/	/	/	/	/	0	0	C
H.	/	/	0	0	/	0	0	0	E
	/	/	0	0	0	0	/	0	C
R.	/	/	0	/	0	/	0	0	E
	/	/	/	0	0	0	0	/	C
OTHERS.	0	0	/	0	/	/	/	/	E
	/	/	0	0	/	/	/	/	C

KEY: / = Mentioned in diary 0 = Not mentioned.

QUESTIONNAIRE ITEMS

(See Chapter XV)

24 MALE SUBJECTS

6, 1, 1, 6, 7, 7, 7, 7, 7, 4, 4, 4, 7, 6, 7, 7, 7, 4, 1, 6, 4, 1, 1, 1, 7, 4, 7, 7, 4, 5, 2, 4, 2, 4, 1, 80
3, 3, 1, 7, 7, 7, 7, 7, 7, 5, 3, 6, 5, 5, 7, 7, 4, 6, 7, 1, 1, 1, 1, 3, 6, 3, 6, 4, 5, 7, 3, 2, 3, 5, 6, 80
4, 1, 1, 5, 7, 6, 5, 3, 5, 5, 3, 5, 5, 6, 7, 6, 6, 1, 1, 2, 1, 1, 1, 2, 7, 7, 7, 6, 4, 7, 1, 4, 1, 3, 1, 68
4, 2, 2, 7, 5, 5, 6, 6, 5, 4, 5, 5, 6, 2, 5, 7, 3, 7, 5, 7, 4, 2, 1, 1, 2, 2, 7, 6, 3, 6, 1, 4, 1, 1, 1, 68
4, 4, 1, 7, 7, 7, 7, 7, 7, 4, 4, 4, 1, 4, 7, 7, 4, 7, 7, 7, 1, 4, 1, 1, 4, 4, 4, 7, 7, 7, 7, 4, 1, 1, 1, 73
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6, 2, 4, 6, 7, 4, 7, 6, 6, 5, 5, 4, 5, 6, 6, 6, 2, 5, 6, 7, 1, 2, 2, 5, 7, 2, 4, 7, 7, 6, 2, 4, 1, 1, 4, 73
1, 2, 5, 6, 5, 7, 4, 1, 1, 5, 1, 3, 1, 1, 1, 1, 1, 5, 1, 6, 6, 1, 1, 1, 4, 1, 4, 7, 2, 1, 4, 1, 1, 1, 2, 37
3, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 4, 2, 1, 1, 1, 4, 2, 3, 1, 5, 6, 3, 1, 1, 1, 2, 13
5, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 7, 1, 4, 1, 7, 1, 1, 2, 1, 1, 1, 13
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1, 6, 1, 5, 6, 7, 7, 7, 7, 7, 6, 6, 5, 5, 5, 3, 4, 4, 1, 4, 1, 1, 1, 4, 4, 1, 5, 6, 5, 5, 1, 4, 1, 1, 1, 76
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3, 3, 1, 5, 6, 4, 3, 4, 3, 2, 1, 2, 1, 1, 3, 4, 1, 2, 2, 3, 1, 1, 1, 1, 1, 2, 5, 3, 3, 3, 1, 1, 1, 1, 2, 39

LUCID-DREAMS, IMAGERY, SLEEP & DREAMS QUESTIONNAIRE DATA.

QUESTIONNAIRE ITEMS

(See Chapter XV)

24 FEMALE SUBJECTS

5, 1, 1, 6, 7, 6, 5, 4, 4, 3, 1, 2, 2, 3, 3, 5, 1, 2, 1, 6, 1, 1, 1, 1, 1, 2, 7, 4, 4, 5, 1, 2, 1, 1, 6, 51
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7, 4, 4, 7, 7, 7, 5, 7, 7, 6, 5, 6, 2, 5, 7, 4, 7, 7, 4, 2, 1, 1, 1, 5, 7, 2, 7, 7, 7, 7, 7, 4, 4, 4, 1, 75
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LUCID-DREAMS, IMAGERY, SLEEP & DREAMS QUESTIONNAIRE DATA.

QUESTIONNAIRE. (See Chapter XV)

1. Do you have dreams in which you realise that you are dreaming? – i.e. in the dream when you are still dreaming you think to yourself 'This is a dream'. Indicate how often you experience such a dream.

NEVER	1 PER MONTH				EVERY NIGHT	
1	2	3	4	5	6	7

2. Do you ever feel that you are literally outside your body? - so that your consciousness is separate from you body, when awake.

NEVER	1 PER MONTH				EVERY NIGHT	
1	2	3	4	5	6	7

3. (Irrelevant)

	No image					As clear as the real thing
4. Attempt to form an image of the entrance to your Home. How vivid is it?	1 2	3	4	5	6	7

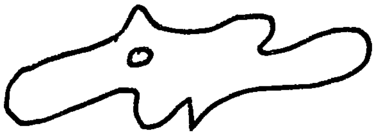
	Not at all					Very easily & naturally
5. How easily can you make the door in the image open or close?	1 2	3	4	5	6	7

	No image					As clear as the real thing
6. Attempt to form a visual image of a friend. How vivid is it?	1 2	3	4	5	6	7

How easily can you make your image of the person:

	Not at all					Very easily & naturally
7. Change facial expression	1 2	3	4	5	6	7
8. Walk along	1 2	3	4	5	6	7
9. Sit down	1 2	3	4	5	6	7

Study this drawing and attempt to form a visual image of it.



	No image					As clear as the real thing
10. How vivid is it	1 2	3	4	5	6	7

How easily can you make you image of the shape above:

	Not at all					Very easily
11. Turn up-side down	1 2	3	4	5	6	7
12. Move along	1 2	3	4	5	6	7
13. Rotate through 90°	1 2	3	4	5	6	7

To what extent do you rely on visual imagery:

	Not at all					Entirely
14. in solving problems	1 2	3	4	5	6	7
15. in remembering events or people	1 2	3	4	5	6	7
16. in understanding a book or story	1 2	3	4	5	6	7

17. Form the image of the entrance to your home again Can you project it onto the wall?

Not at all Very easily
1 2 3 4 5 6 7

18. When you are going to sleep, yet still awake, do you ever see images?

Never Once a month Always
1 2 3 4 5 6 7

19. Similarly, when you wake in the morning, do you ever see images?

Never Once a month Always
1 2 3 4 5 6 7

20. If you've been doing something repetitive for a long time (like picking strawberries), or driving), hours afterwards, do you still tend to see what you were doing?

Never Once a month Always
1 2 3 4 5 6 7

21. Do you ever feel that your body is enlarging or decreasing in size?

Never Once a month Always
1 2 3 4 5 6 7

22. Have you ever seen any kind of ghost?

Never Once a month Always
1 2 3 4 5 6 7

23. Can you see auras around people? (An aura is an area of light around the body which some people say they can see).

Never Once a month Always
1 2 3 4 5 6 7

24. Have you ever looked at a person and made them appear to shrink or expand in size?

Never Once a month Always
1 2 3 4 5 6 7

25. Do you believe in E.S.P., or telepathy?

Don't believe Not sure Believe fully
1 2 3 4 5 6 7

26. Have you ever experienced anything which you would interpret as being telepathy or E.S.P.?

Never Once a month Very often
1 2 3 4 5 6 7

27. Do you ever daydream?

Never Once a month Every day
1 2 3 4 5 6 7

28. How vivid, visually, are your daydream images compared to real-life objects and people? (On average)

No image As clear as in real-life
1 2 3 4 5 6 7

29. Do you ever recall your night dreams?

Never Once a month Always
1 2 3 4 5 6 7

30. How vivid, visually, are you night dream images compared to real-life objects and people? (On average)

No image As clear as in real-life
1 2 3 4 5 6 7

31. Do you ever see yourself in dreams? (i.e. your own face)
Never Once a month Every night
1 2 3 4 5 6 7

32. Do you ever have recurring dreams?
Never Once a month Every night
1 2 3 4 5 6 7

33. Do you sleep-walk, as far as you know?
Never Once a month Every night
1 2 3 4 5 6 7

34. Do you sleep-talk, as far as you know?
Never Once a month Every night
1 2 3 4 5 6 7

35. When going to sleep, do you ever experience a physical falling sensation?
Never Once a month Every night
1 2 3 4 5 6 7

******

Item 36 in the correlation data is the total score obtained from the imagery questions 4-16.

STUDENT'S T-TEST BETWEEN MEANS OF 2 INDEPENDENT SAMPLES.

A. REPORTED FREQUENCY OF LUCID-DREAMS DATA.

MALES: (N=24)
6, 3, 4, 4, 4, 5, 6, 1, 3, 5, 1, 4, 1, 5, 1, 3, 2, 2, 1, 5, 1, 2, 1, 3 (Mean: 3.04)

FEMALES: (N=24)
5, 4, 4, 3, 5, 5, 3, 7, 4 ,4 ,3, 4, 7, 4, 6, 4, 2, 1, 5, 6 ,4, 5, 3, 2 (Mean: 4.17)

Degrees of freedom: 46

STUDENT'S T = 2.41

P = 0.02

******

B. IMAGERY SCORES DATA.

MALES: (N=24)
80, 80, 68, 68, 73, 60, 73, 37, 13, 13, 60, 59, 59, 37, 76, 72, 74, 79, 70, 68, 53, 66, 46, 39 (Mean: 59.29)

FEMALES: (N=24)
51, 68, 69, 81, 63, 73, 41, 75, 83, 70, 40, 66, 75, 62, 41 ,62 ,67, 72, 71 ,72, 82, 54, 54, 76 (Mean: 65.33)

Degrees of freedom: 46

STUDENT'S T = 1.28

NOT SIGNIFICANT.

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